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TECHNICAL MANUAL

ORIGINAL
COMPLETED
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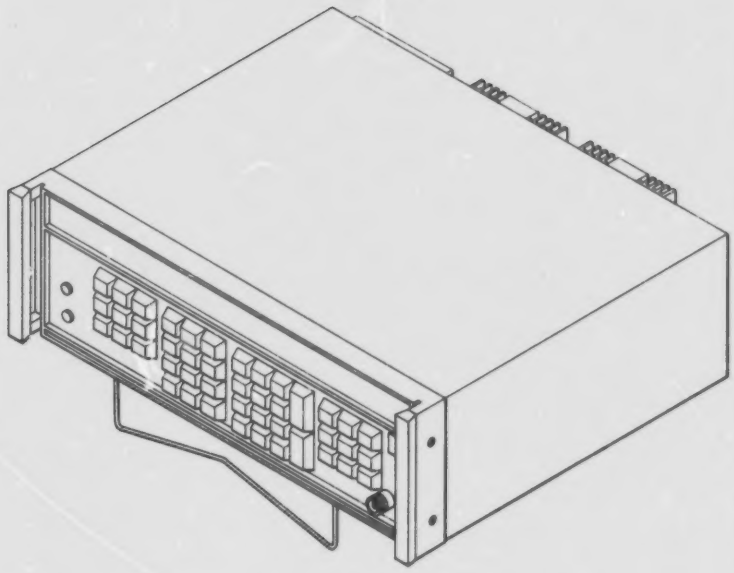
GENERAL SUPPORT MAINTENANCE



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TEST SET, RECEIVER AN/ARM-180 (NSN 6625-01-041-4161)

HEADQUARTERS, DEPARTMENT OF THE ARMY

9 JULY 1985

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5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1 DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

2 IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

3 IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A WOODEN POLE OR A ROPE OR SOME OTHER INSULATING MATERIAL

4 SEND FOR HELP AS SOON AS POSSIBLE

5 AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

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WARNING

HIGH VOLTAGE

is used in the operation of this equipment.

DEATH ON CONTACT

may result if personnel fail to observe safety precautions.

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When technicians are aided by operators, they must be warned about dangerous areas.

Be careful not to contact high-voltage connections of 115 vac input connections when installing or operating this equipment.

Dangerous potentials exist at several points throughout this equipment when the equipment is operated with the case removed. Do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect power before cleaning the equipment or replacing parts.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

For artificial respiration, refer to FM 21-11.

WARNING

TRICHLOROTRIFLUOROETHANE

Fumes of TRICHLOROTRIFLUOROETHANE are poisonous. Provide adequate ventilation whenever you use TRICHLOROTRIFLUOROETHANE. Do not use solvent near heat or open flame. TRICHLOROTRIFLUOROETHANE will not burn, but heat changes the gas into poisonous, irritating fumes. DO NOT breathe the fumes or vapors. TRICHLOROTRIFLUOROETHANE dissolves natural skin oils. DO NOT get the solvent on your skin. Use gloves, sleeves, and an apron which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

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Technical Manual

No. 11-6625-2975-40

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 9 July 1985

General Support Maintenance Manual

TEST SET, RECEIVER AN/ARM-180 (NSN 6625-01-041-4161)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes, or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, New Jersey 07703-5007. A reply will be furnished direct to you.

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*This manual, together with TM 11-6625-2975-12, 27 August 1984 and TM 11-6625-2975-24P, 19 July 1984, supersedes TM 11-6625-2975-14&P, 30 December 1980.

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HOW TO USE THIS MANUAL

This manual is designed to help you maintain Test Set, Receiver AN/ARM-180.

The boxed entries on the front cover are provided for quick reference to important information. There is also an alphabetical index in the rear of the book to help locate specific information.

Measurements in this manual are given in both US standard and metric units.

Read all preliminary information found at the beginning of each procedure. It contains important information which must be followed to perform tasks correctly.

Warning pages are located in the front of this manual. You should learn the warnings before doing maintenance on the equipment.

Paragraphs in this manual are numbered by chapter and order of appearance within a chapter. A subject index appears at the beginning of each chapter, breaking the chapter into sections. A more specific subject index is located at the beginning of each section to help you find the exact paragraph you are looking for.

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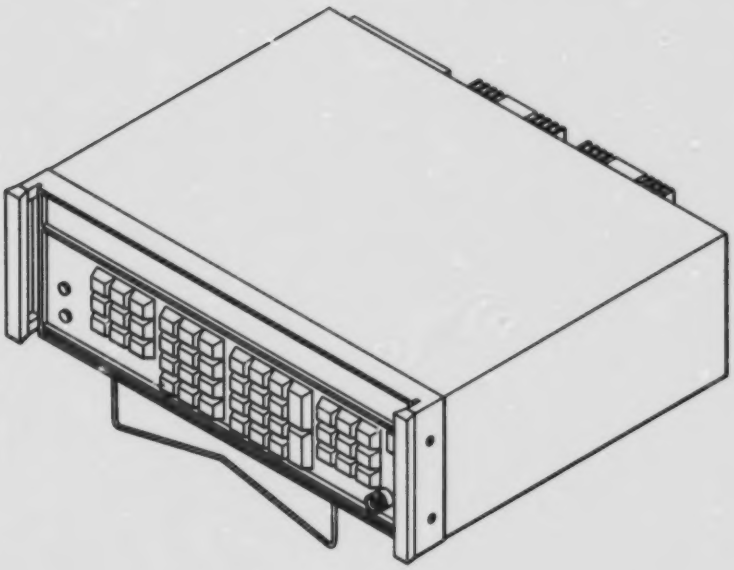

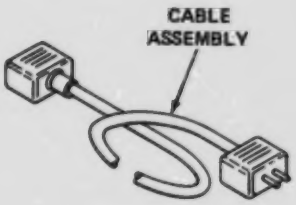

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TEST SET, RECEIVER AN/ARM-180

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III

CHAPTER 1

INTRODUCTION

Subject	Section	Page
General Information	I	1-1
Equipment Description and Data	II	1-3
Principles of Operation	III	1-6

OVERVIEW

This manual contains principles of operation, maintenance procedures, and troubleshooting procedures at the general support level for Test Set, Receiver AN/ARM-180.

Section I GENERAL INFORMATION

Subject	Para	Page
Scope	1-1	1-1
Consolidated Index of Army Publications and Blank Forms	1-2	1-1
Maintenance Forms, Records, and Reports	1-3	1-1
Destruction of Army Electronics Materiel	1-4	1-2
Calibration	1-5	1-2
Administrative Storage	1-6	1-2
Nomenclature Cross-Reference List	1-7	1-2
Reporting Equipment Improvement Recommendations (EIR)	1-8	1-2

1-1. SCOPE.

Type of Manual: General support maintenance manual.

Equipment Name and Model Number: Test Set, Receiver AN/ARM-180.

Purpose of Equipment: Test and troubleshoot VOR, ILS, and marker beacon navigation receivers.

1-2. CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS.

Refer to the latest issue of DA Pam 310-1 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

1-3. MAINTENANCE FORMS, RECORDS, AND REPORTS.

REPORTS OF MAINTENANCE AND UNSATISFACTORY EQUIPMENT

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 as contained in Maintenance Management Update.

REPORT OF PACKAGING AND HANDLING DEFICIENCIES

Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73A/AFR 400-54/MCO 4430.3F.

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1-3. MAINTENANCE FORMS, RECORDS AND REPORTS. (CONT)

DISCREPANCY IN SHIPMENT REPORT (DISREP) (SF361)

Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

1-4. DESTRUCTION OF ARMY ELECTRONICS MATERIEL.

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

1-5. CALIBRATION.

Refer to TB 9-6625-2076-35 for calibration procedures.

1-6. ADMINISTRATIVE STORAGE.

Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance to PMCS charts before storing. Refer to TM 11-6625-2975-12.

1-7. NOMENCLATURE CROSS-REFERENCE LIST.

This list contains common names used throughout this manual in place of official nomenclature.

COMMON NAME	OFFICIAL NOMENCLATURE
test set	Test Set, Receiver AN/ARM-180

1-8. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your test set needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications - Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, New Jersey 07703-5007. A reply will be furnished direct to you.

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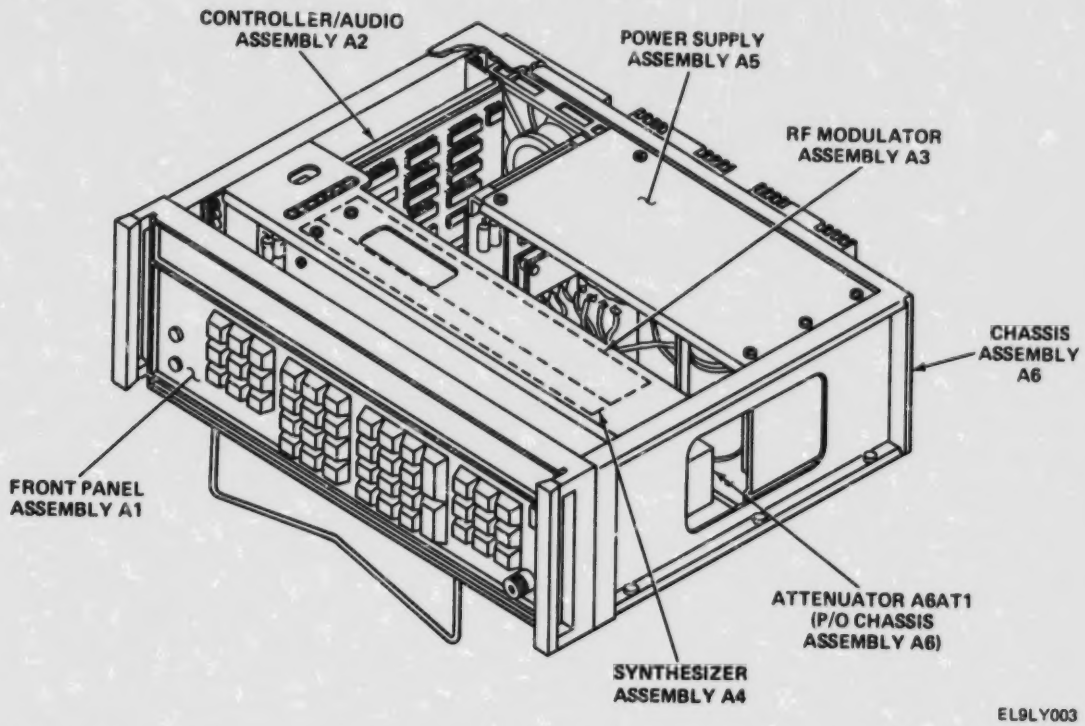
Section II EQUIPMENT DESCRIPTION AND DATA

Subject	Para	Page
Equipment Characteristics, Capabilities, and Features	1-9	1-3
Location and Description of Major Components	1-10	1-3
Equipment Data	1-11	1-4
Safety, Care, and Handling	1-12	1-6

1-9. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

For characteristics, capabilities, and features of the test set, refer to TM 11-6625-2975-12.

1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.



1. Front Panel Assembly A1. Located in front of test set, provides the operator with means of communicating with equipment. Contains keyboard for entering instructions and displays for indicating test parameters.

2. Controller/Audio Assembly A2. Located in left side of test set, contains a microprocessor that handles all instructions to equipment. Houses memory circuits and an audio generator.

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1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS. (CONT)

3. RF Modulator Assembly A3. Located behind front panel assembly A1, combines carrier frequency with audio modulation signal to produce a simulated ground station signal.

4. Synthesizer Assembly A4. Located between front panel assembly A1 and rf modulator assembly A3, produces test set-selected carrier frequency.

5. Power Supply Assembly A5. Located at rear of test set, supplies all voltages required for test set operation.

6. Chassis Assembly A6. Consists of test set's interconnecting wiring and digitally-controlled attenuator. Digitally-controlled attenuator A6AT1, located directly behind front panel RF OUT connector, determines amount of attenuation required to provide an rf output signal with selected output level.

1-11. EQUIPMENT DATA.

TM 11-6625-2975-12 contains a complete list of the test set's physical and environmental specifications and those electronic specifications needed to support lower level maintenance. The following list contains additional electronic data needed for general support maintenance.

CHARACTERISTIC	SPECIFICATION
Very High Frequency Omnidirectional Range (VOR) Mode	
Modulation Tones	
Distortion (audio)	
30 Hz reference and 30 Hz variable	± 0.25 percent
9960 Hz and 1020 Hz	± 0.50 percent
9960 Hz FM deviation	480 Hz ± 2 Hz peak
Amplitude Modulation	
Range (per tone)	
Preset (1020 Hz, 30 Hz variable, 9960 Hz)	30.0 percent
Variable	10.0 to 35.0 percent in 0.1-percent increments
Accuracy	± 2.5 percent of indicated modulation for present mode
Tone distortion (at 30 percent modulation)	
30 Hz Variable	< 1.0 percent
9960 Hz	< 1.5 percent
1020 Hz	< 1.0 percent
VOR Radial Accuracy	± 0.01 degree of selected radial
Localizer (LOC) and Glide Slope (GS) Mode	
Modulation Tones	
Distortion (audio)	
90 and 150 Hz	< 0.25 percent
1020 Hz	< 0.50 percent

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1-11. EQUIPMENT DATA. (CONT)

CHARACTERISTIC	SPECIFICATION
90 and 150 Hz Phase	
Fixed	0.0 degrees
Selectable	60 degrees
Amplitude Modulation	
Range (per tone)	
Localizer	
Preset	20.0 percent
Variable (at beam center only)	5.0 to 40.0 percent, in 0.1-percent increments
Glide Slope	
Preset	40.0 percent
Variable (at beam center only)	10.0 to 80.0 percent, in 0.1-percent increments
1020 Hz (localizer only)	30.0 percent, fixed
Accuracy	± 2.5 percent of indicated modulation
Tone Distortion (rf)	
Localizer, 90 and 150 Hz	< 1.2 percent (20-percent modulation)
Glide Slope, 90 and 150 Hz	< 1.2 percent
1020 Hz (localizer only)	< 1.0 percent (30-percent modulation)
Difference in Depth of Modulation (DDM)	
Localizer	
Preset	0.000
Selectable settings	0.000, ± 0.046, ± 0.093, ± 0.155, ± 0.200
Variable range	± 0.400, in 0.001 increments
Glide Slope	
Preset	0.000
Selectable settings	0.000, ± 0.045, ± 0.091, ± 0.175, ± 0.400
Variable range	± 0.800, in 0.001 increments
Audio error	
On-course	0.0001 DDM
Off-course	0.0002 DDM
Modulation Error	
Localizer	
On-course	0.00046 DDM
Off-course	0.00046 DDM + 2.5 percent DDM
Glide Slope	
On-course	0.00092 DDM
Off-course	0.00092 DDM + 2.5 percent DDM
Total System Error (audio and modulation)	
Localizer	
On-course	0.00056 DDM
Off-course	0.00056 + 2.5 percent DDM
Glide Slope	
On-course	0.00102 DDM
Off-course	0.00102 + 2.5 percent DDM

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1-11. EQUIPMENT DATA. (CONT)

CHARACTERISTIC	SPECIFICATION
Marker Beacon (MB)	
Distortion (audio)	< 1.0 percent
Amplitude modulation	
Range	
Preset	95.0 percent
Variable	90.0 to 97.0 percent, in 0.1-percent increments
Accuracy	± 5 percent
Tone distortion	< 4 percent

1-12. SAFETY, CARE, AND HANDLING.

Be sure to obey all warnings, cautions, and notes given in this manual. Failure to follow directions may result in serious injury to personnel and/or damage to equipment.

Section III PRINCIPLES OF OPERATION

Subject	Para	Page
General	1-13	1-6
System Operation	1-14	1-7
Microprocessor (CPU) Operation	1-15	1-9
Front Panel Assembly Operation	1-16	1-10
Audio Modulation Generator Operation	1-17	1-11
RF Section Operation	1-18	1-13
Power Supply Assembly Operation	1-19	1-15

1-13. GENERAL.

This section contains information covering principles of operation of the major electronic assemblies of the test set. The material is presented in functional block diagram format, with supporting text which explains the operation of each assembly.

Details pertaining to the operation of individual components in each assembly are not discussed in this section. Instead, the text is intended to explain how each assembly contributes to the operation of the test set.

At the General Support level of maintenance, electronic components within test set assemblies are not replaced. Because of this maintenance approach, this section does not discuss the performance of specific circuits and components such as diodes, transistors, etc. In fact, it is not necessary to understand how the circuits in an assembly operate to effectively troubleshoot or aline it. However, it is very important to know what an assembly actually does in order to perform signal checks at test points for the purpose of testing, troubleshooting, or alining the assembly.

A detailed system block diagram is found in FO-2 in the back of this manual. Refer to this foldout while reading the following text.

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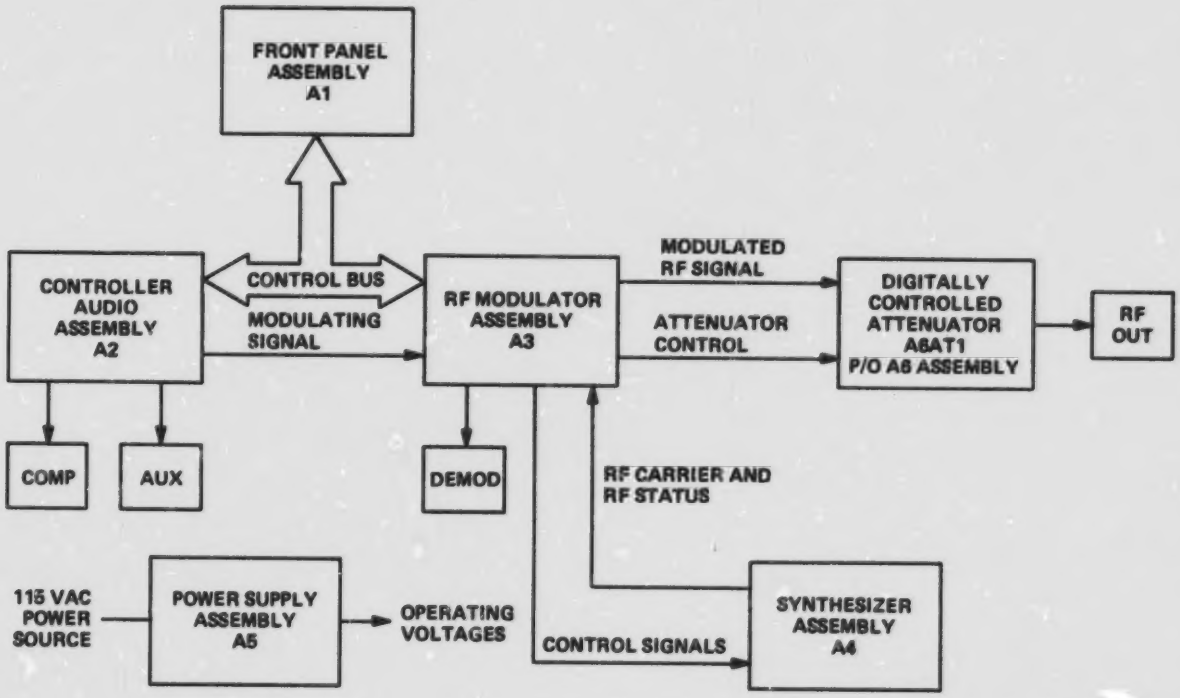
1-14. SYSTEM OPERATION.

The test set is a microprocessor-controlled signal generator that produces modulated rf signals for use in testing VOR, localizer, glide slope, and marker beacon receivers. It consists of the following major assemblies:

1. Front panel assembly A1
2. Controller/audio assembly A2
3. Rf modulator assembly A3
4. Synthesizer assembly A4
5. Power supply assembly A5
6. Chassis assembly A6.



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The heart of the test set circuitry is a microprocessor, which controls the test set's internal functions through a control bus. The microprocessor is part of controller/audio assembly A2. This assembly also contains memory circuits and an audio generator. The microprocessor uses the control bus to apply instructions from the memory circuits to the audio generator. The audio generator produces the signals required to modulate the rf carrier.

Front panel assembly A1 includes the operator's keyboard and the digital displays that depict the operator-selected data. This assembly processes keyboard entries as instructed by the microprocessor, through the control bus.

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1-14. SYSTEM OPERATION. (CONT)

Rf modulator assembly A3 uses microprocessor-generated data it receives through the control bus to produce rf frequency control signals. It also combines modulating signals from the audio generator in controller/audio assembly A2 with rf carrier from the A4 synthesizer assembly.

Rf frequency control signals from rf modulator assembly A3 are applied to synthesizer assembly A4. This assembly uses control signals to produce selected rf carrier frequency and rf status information.

NOTE

Rf status information verifies that the synthesizer is locked on frequency.

Rf carrier frequency is then applied to assembly A3 for modulation. Rf status information also is applied to assembly A3.

Rf modulator assembly A3 sends frequency and status information supplied by synthesizer assembly A4 back to the microprocessor through the control bus. The microprocessor in turn supplies this information to front panel assembly A1, again through the control bus. Front panel assembly A1 uses the information supplied by the microprocessor to produce appropriate front panel displays.

Modulated rf signal and an attenuator control signal are applied through digitally-controlled attenuator A6AT1 (p/o assembly A6) to the RF OUT connector. Attenuator control signal determines the amount of attenuation required for the digitally-controlled attenuator to produce an rf output signal with the selected output level.

Simulated ground station signal is applied from the RF OUT connector to the receiver under test. Controller/audio assembly A2 applies composite and auxiliary signals to connectors on the rear of the test set. Rf modulator assembly A3 applies a demodulation signal to a third connector on the rear of the test set.

Chassis assembly A6, which includes digitally-controlled attenuator A6AT1, contains all the test set's interconnecting wiring.

Power supply assembly A5 produces all dc voltages needed for test set operation.

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1-15. MICROPROCESSOR (CPU) OPERATION.

Refer to FO-2 while reading the text in this paragraph.

The microprocessor, also referred to as the central processing unit (cpu), controls all internal signal generator operations and is contained in cpu assembly A2A1.

The cpu is interconnected with front panel assembly A1, rf modulator assembly A3, and TDM board A2A3 by a parallel control bus. The control bus is capable of handling 8-bit addresses, 8-bit data, and I/O read and write pulses. The 8-bit addresses and the I/O read/write pulses are transmitted only from the cpu while the 8-bit data can be generated by the cpu or, on request, obtained from A1A1, A2A3, or A3A3, depending on I/O port addressed.

The 8-bit address selects the correct I/O port. The I/O read pulse strobes data out of the port over the control bus to the cpu. The I/O write pulse strobes data from the cpu into the correct I/O port via the control/data bus.

KEYBOARD OPERATION

Every 4 milliseconds the cpu is internally interrupted, and when these interruptions occur, address, data, and I/O write pulses from the cpu are supplied over the control bus to the I/O port on the front panel assembly A1. The I/O port supplies this data to a keyboard matrix, which is scanned to determine if any keys have been pressed. If the scanner detects any key has been pressed, that data is returned to the I/O port on the A1 card. Upon request from the cpu, this information is returned to the cpu over the control bus. The cpu stores this information in memory, but does not act on it until it receives the same information 12 times in 12 consecutive scanner cycles. On the twelfth cycle, the cpu recognizes the key entry as valid and proceeds to act on the data stored in memory. In order to ensure the data is valid and not just key bounce, 12 consecutive cycles are required. Since the keyboard is arranged in a matrix, the data contains the key position in the matrix.

When rf frequency, VOR radial, DDM, or percent modulation entries are made with the keyboard, the cpu recognizes and stores the data until the DATA ENTRY-ENTER key is pressed. When the cpu recognizes the ENTER key data, the stored information is processed. If a mistake is made when entering data, or if an invalid entry is made producing a blinking display, the operator uses the DATA ENTRY-CLEAR key to clear the cpu memory.

When key activity is not detected by the scanner, the scanner continues to perform its normal routine. In its normal routine, the scanner:

1. Monitors the keyboard
2. Requests a frequency count from A3 to make sure the frequency displayed is accurate
3. Requests the status of synthesizer phase lock from A3 to make sure the selected rf output frequency remains phase-locked to the reference frequency
4. Requests the rf level calibration from A3 to make sure the rf level is within specified limits.

At every scanner loop the same information is requested. If the information is not available when requested, it is obtained during subsequent loops.

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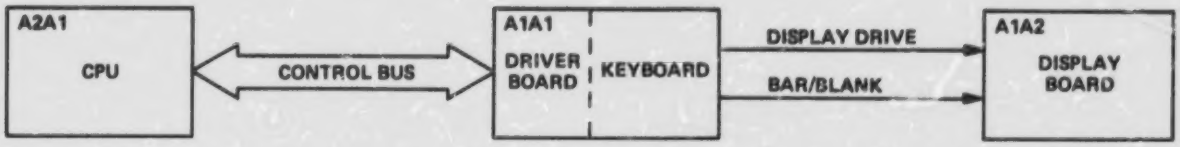
1-16. FRONT PANEL ASSEMBLY A1 OPERATION.

Refer to FO-2 and the following diagram while reading the text in this paragraph.



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Front panel assembly A1A1 provides the operator with the means of communicating with test set. The keyboard allows operator to select the required signals for testing, troubleshooting, alining, and/or adjusting the unit under test. Digital displays and LED indicators on display board A1A2, plus lighted keys on A1A1, provide operator with a readout of output signal parameters.

KEYBOARD DRIVER BOARD A1A1

Driver board A1A1 contains I/O ports, keyboard, display driver circuits, bar/blanking circuits, and key light driver circuits. Driver board A1A1 I/O ports are connected to the parallel control bus. All information is received and transmitted through the I/O ports through the control bus. When cpu addresses I/O port and a write pulse is generated, data on the input of the I/O port is supplied to the correct circuit in driver board A1A1.

When cpu data at driver board A1A1 I/O port requests that a display be lit, this data gets latched in the display driver circuits. The display driver circuits then generate display driver signals that are supplied to display board A1A2, lighting the correct display. If data at driver board A1A1 I/O port requests either to bar or blank a digital display, data is supplied to the bar/blank circuit. The bar/blank circuit produces correct bar or blank signals and supplies them to display board A1A2, which then bars or blanks correct digital display. When data at the I/O port requests a specific key be lit, data is latched in the key light driver circuit. The light driver circuit then provides a lamp drive signal for lighting the correct lamp.

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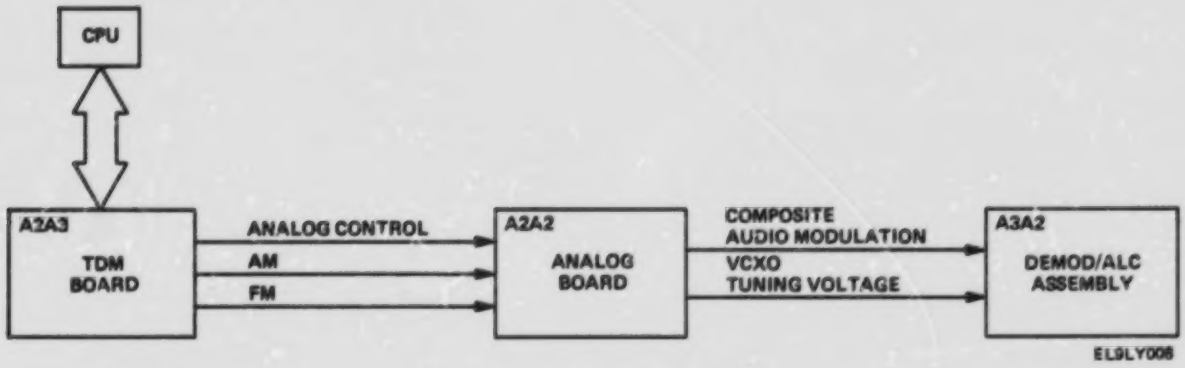
1-17. AUDIO MODULATION GENERATOR OPERATION.

Refer to FO-2 and the following diagram while reading the text in this paragraph.



The audio modulation generator, consisting of TDM board A2A3 and analog board A2A2, produces audio signals used to modulate the selected rf carrier signal. The selected rf frequency (mode or operation) controls the modulation requirements on the generator. When an rf carrier frequency is selected, data from the cpu is supplied over the control bus to I/O port of TDM board A2A3. This data is used to program the modulation generator to generate the correct audio signals. All audio modulation and analog control signals are generated on TDM board A2A3 and supplied to analog board A2A2. Signals applied to the analog board are processed as described in the following modes.

VOR MODE

In VOR mode, A2A3 generates 1020-Hz audio tone, 30-Hz variable, 9960-Hz, and 9960-Hz FM (30-Hz reference) signals that are supplied to analog board A2A2. Analog board A2A2 filters audio modulation signals and combines all VOR signals to produce a composite VOR modulation signal. This signal is supplied to demodulator/alc assembly A3A2. The phase relationship of the 30-Hz variable and the 30-Hz reference signals determine the VOR radial.

Phase information relating to the 30-Hz variable and 30-Hz reference signals is read back to the CPU by TDM board A2A3 when requested by the CPU. This phase information is transmitted to the CPU through the control bus and is used to generate the VOR radial displayed on the front panel.

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1-17. AUDIO MODULATION GENERATOR OPERATION. (CONT)

A 1020-Hz audio tone can also be added to the composite audio modulation signal. The 1020-Hz audio tone simulates an identification signal. The 1020-Hz signal is combined with the other two modulation signals in analog board A2A2.

In VOR mode, FM modulation can be removed from the standard 9960-Hz FM tone by depressing the 9960 Hz key.

Analog board A2A2 also supplies the composite modulation signal to a COMP connector on the rear panel and a 30-Hz reference signal (VOR mode only) to an AUX connector on the rear panel.

LOCALIZER AND GLIDE SLOPE MODE

In either localizer or glide slope mode, TDM board A2A3 generates 90- and 150-Hz signals. These signals are supplied to analog board A2A2 together with a localizer or glide slope mode analog control signal. Analog board A2A2 filters the 90- and 150-Hz signals to produce the audio modulation signal supplied to demodulator/alc assembly A3A2. For changing the difference in depth of modulation (DDM), cpu programs TDM board A2A3 to modify the amplitudes of the 90- and 150-Hz signals as required.

In the localizer mode, a 1020-Hz audio tone can also be added to the composite audio modulation signal. The 1020-Hz signal is combined with the other two modulation signals on analog board A2A2.

MARKER BEACON MODE

Depending on keyboard selection and subsequent data from the cpu, TDM board A2A3 generates one of three available audio modulation signals.

1. Outer marker tone – 400-Hz audio tone
2. Middle marker tone – 1300-Hz audio tone
3. Inner marker tone – 3000-Hz audio tone

A marker beacon analog control signal is generated by TDM board A2A3 and supplied to analog board A2A2. Analog board A2A2 filters the audio tone and supplies the filtered tone to demodulator/alc assembly A3A2.

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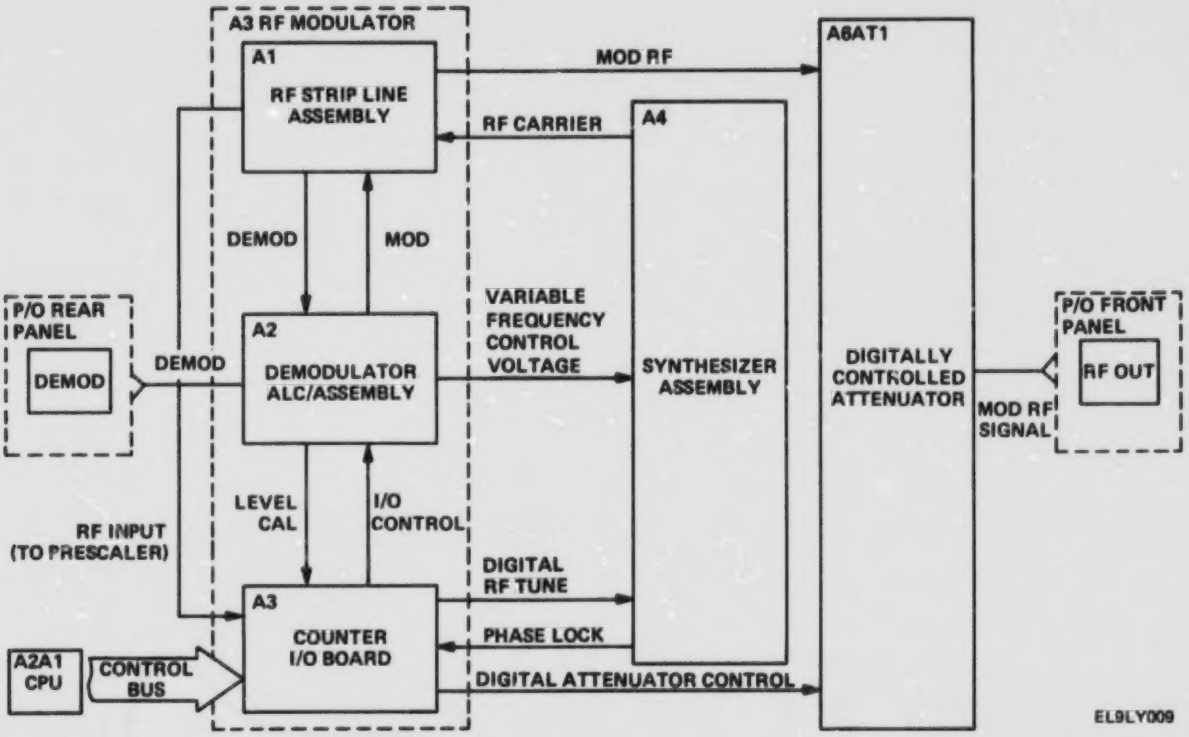
1-18. RF SECTION OPERATION.



The rf section consists of:

1. Rf modulator assembly A3
2. Synthesizer assembly A4
3. Digitally controlled attenuator A6AT1.

The rf modulator assembly A3 is made up of:

1. Rf strip line assembly A3A1
2. Demodulator/alc assembly A3A2
3. Counter I/O board A3A3.

The rf section generates the rf carrier signal, modulates the carrier signal with the audio modulation signal, and adjusts the rf output level. The modulated rf signal from digitally-controlled attenuator A6AT1 is then applied to the RF OUT connector on the front panel.

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1-18. RF SECTION OPERATION. (CONT)

Synthesizer assembly A4 generates the rf carrier signal at the frequency specified by the rf tune signal from counter I/O board A3A3. The synthesizer assembly A4 employs a phase-lock loop to provide a stable rf output frequency. A variable oscillator in the synthesizer assembly provides the means for slewing the frequency as requested by the keyboard entries.

The rf output from synthesizer assembly A4 is supplied to rf strip line assembly A3A1. The audio modulation signal from demodulation/alc assembly A3A2 is also supplied to rf strip line assembly A3A1 and used to modulate the rf carrier signal. The modulated rf signal is then supplied to the digitally-controlled attenuator A6AT1, which is set to the correct attenuation for the output level selected.

Counter I/O board A3A3 contains the I/O ports for connecting the rf section to the control bus. It also contains an rf frequency counter that provides rf frequency information to the cpu to be displayed on the front panel.

RF FREQUENCY SELECTION

The cpu sends rf frequency control data over the control bus to I/O ports on counter I/O board A3A3. Counter I/O board A3A3 routes this control data to synthesizer assembly A4. This digital rf tune signal tunes synthesizer assembly A4 to the selected carrier frequency. Synthesizer assembly A4 then generates the selected rf carrier frequency and supplies the signal to rf strip line assembly A3A1. When a sampling of this rf carrier frequency indicates that the frequency is phase-locked to a 25 kHz loop-lock frequency, a phase-lock status signal is supplied to counter I/O board A3A3. The cpu also sends data over the control bus to the I/O ports of A3A3 indicating the mode selected. Counter board I/O A3A3 converts this mode selection data into I/O control signals and supplies them to demodulator/alc assembly A3A2. The I/O control signals adjust the audio modulation levels from analog board A2A2 to a correct level, providing a standard percent of modulation for each mode. To change the percent of modulation to other than the standard percentage, the audio modulation signals in the audio generator circuits must be adjusted. Demodulator/alc assembly A3A2 checks and automatically adjusts the level of modulation and then supplies the signal to rf strip line assembly A3A1.

The composite audio modulation is combined with the rf carrier signal on rf strip line A3A1 to produce a modulated rf signal. This signal is supplied through the digitally-controlled attenuator A6AT1 to the RF OUT connector on the front panel. The digitally-controlled attenuator sets the rf output level. The cpu also transmits data over the control bus to the ports on counter I/O board A3A3 for selecting the desired rf output level. The data on the control bus is routed to the digitally-controlled attenuator A6AT1 by counter I/O board A3A3. The binary-controlled signal sets the attenuator to the correct level for producing the selected rf output level at the RF OUT connector on the front panel. When microvolt readings are being displayed on the RF LEVEL display, an additional 6-db attenuation is inserted. This additional 6-db attenuation makes the signal output at the RF OUT connector one-half of the displayed RF LEVEL value. This results in an output which is hard microvolts, without the use of an external 6-db pad. When the rf output is being displayed in db mw, the additional 6-db attenuation is removed, and the signal output at the RF OUT connector is absolute, the same RF LEVEL is being displayed on the front panel.

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1-18. RF SECTION OPERATION. (CONT)

The rf strip line assembly A3A1 produces a signal that is the rf carrier frequency. It also produces a demodulated signal which is the modulated signal with the rf carrier removed. The rf signal is supplied to the counter I/O board A3A3 and the demodulator signal to demodulator/alc assembly A3A2. Counter I/O board A3A3 counts the rf signal to determine the output signal frequency. This information is supplied to the counter I/O board A3A3 output ports. When the cpu requests the frequency count, this information is supplied to the cpu through the control bus. The cpu uses this frequency count to supply frequency information to be displayed in the FREQUENCY display of the front panel. When requested by the cpu, counter I/O board A3A3 supplies phase-lock information from the I/O port over the control bus. The cpu uses this information to supply data to the front panel assembly for the control of RF STATUS-PH LOCK indicator.

The demodulator signal from rf strip line assembly A3A1 is supplied to demodulator/alc assembly A3A2. This signal is used to level the rf carrier and to linearize the modulation signal supplied to rf strip line assembly A3A1. The demodulation signal is also supplied to the DEMOD connector on the rear panel. When the rf output is within specified limits, a calibration signal is supplied to an I/O port on counter I/O board A3A3. This calibration status information is continually being sampled and the information returned over the control bus to the cpu. The cpu uses this calibration status information for supplying data to the front panel assembly RF STATUS-LEVEL CAL indicator.

1-19. POWER SUPPLY ASSEMBLY OPERATION.

EL9LY010

The test set can operate on either 115 or 230 vac, 50/60 Hz power supply. The power supply assembly produces + 24, + 15, -15, + 12, + 9, and + 5 vdc for the test set operation.

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CHAPTER 2

MAINTENANCE

Subject	Section	Page
Repair Parts, Special Tools, TMDE, and Support Equipment	I	2-1
Performance Tests	II	2-1
Troubleshooting	III	2-17
Alinement and Adjustment Procedures	IV	2-31
General Support Maintenance Procedures	V	2-45

Section I REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Subject	Para	Page
Special Tools, TMDE, and Support Equipment	2-1	2-1
Repair Parts	2-2	2-1

2-1. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

Special tools, TMDE, and support equipment are listed in the repair parts and special tools list (RPSTL), TM 11-6625-2975-24P, and in the Maintenance Allocation Chart (MAC) in TM 11-6625-2975-12.

2-2. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (RPSTL), TM 11-6625-2975-24P.

Section II PERFORMANCE TESTS

Subject	Para	Page
General	2-3	2-1
Initial Power On, Self-Test, and Operational Check	2-4	2-2
Frequency Accuracy Performance Test	2-5	2-2
Frequency Response Performance Test	2-6	2-5
Output Attenuator Accuracy Performance Test	2-7	2-5
Modulation Tone Distortion Performance Test	2-8	2-6
9960 FM Deviation Performance Test	2-9	2-7
VOR Radial Accuracy Performance Test	2-10	2-8
LOC DDM Performance Test	2-11	2-10
Glide Slope DDM Performance Test	2-12	2-12
AM Modulation Performance Test	2-13	2-14
Power Supply Performance Test	2-14	2-15

2-3. GENERAL.

The following tests will enable you to determine whether or not a test set is operating acceptably. Each test procedure checks a specific function of the test set to help you find and isolate faults. When a fault is evidenced by failure of the test set to meet a performance test standard, you will be referred to the appropriate troubleshooting chart in section III of this chapter.

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16.

2-3. GENERAL. (CONT)

Each test is complete and may be performed individually. Therefore, you may choose the appropriate test to verify gross equipment failure or performance degradation of a specific module. However, this maintenance approach is not recommended. It is best to perform all the tests in sequence. This systematic maintenance approach will ensure that all faults are found and corrected.

WARNING

HIGH VOLTAGE is used during the following tests. **DEATH ON CONTACT** may result if personnel fail to observe safety precautions.

Dangerous potentials exist at several points throughout this equipment, when the equipment is operated with the case removed. Do not touch exposed connections or components.

NOTE

In order to obtain proper results, all tests should be performed under the following environmental conditions: temperature, +50° to +104°F (+10° to +40°C); maximum relative humidity, 95 percent.

2-4. INITIAL POWER ON, SELF-TEST, AND OPERATIONAL CHECK.

Before starting the performance test sequence, do the initial adjustments, self-test, and operational check as described in TM 11-6625-2975-12. If test set fails any portion of these tests, turn to the troubleshooting section of this manual and follow the steps in troubleshooting chart 2-1.

2-5. FREQUENCY ACCURACY PERFORMANCE TEST.

NOTE

This test checks output and modulation tone frequencies.

TEST EQUIPMENT REQUIRED: Adapter, N plug-to-BNC jack
Frequency Counter HP 5345A
RF Cable RG-58/U

EQUIPMENT SETUP: Connect test set to 115 vac power source.
Connect frequency counter to test set as indicated in the following diagram.

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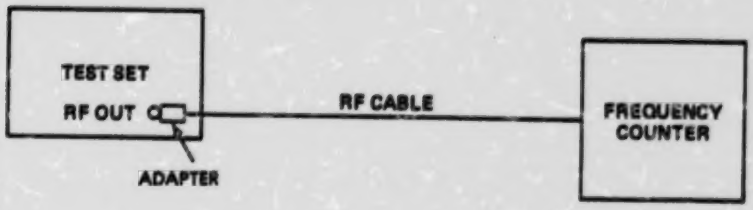
2-5. FREQUENCY ACCURACY PERFORMANCE TEST. (CONT)



EL9LY011

Turn equipment on. Allow at least 30 minutes for warmup.

PROCEDURE

1. Enter frequency.
2. Set test set RF LEVEL to −6 dBmW.
3. Remove modulation by extinguishing all lit TONE SELECT keys.
4. Observe frequency counter display. It should indicate between the limits listed below. If not, go to troubleshooting chart 2-1, sh 1.
5. Repeat procedure for all frequencies listed in the following table.

FREQUENCY (MHz)	FREQUENCY COUNTER DISPLAY LIMITS (MHz)
74.600	74.599851 to 74.600149
75.400	75.399849 to 75.400151
117.950	117.949764 to 117.950236
329.150	329.149342 to 329.150658
335.000	334.999330 to 335.000670
108.000	107.999784 to 108.000216

NOTE

TONE SELECT keys must be extinguished after each frequency change.

6. Press test set ΔF key.

NOTE

ΔF key will light.

7. Press and hold FAST DECR key until frequency counter stops counting.
8. Observe frequency counter display. It should indicate less than 107.9676 MHz. If not, go to troubleshooting chart 2-1, sh 1.

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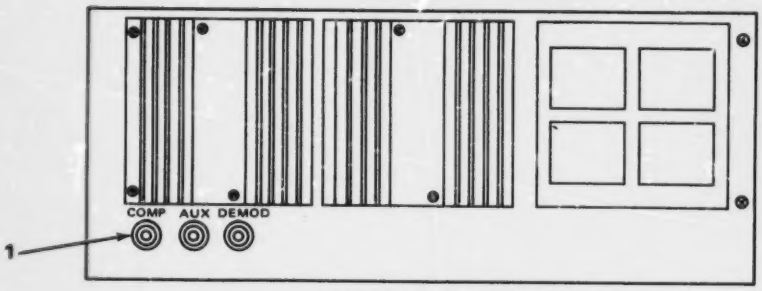
2-5. FREQUENCY ACCURACY PERFORMANCE TEST. (CONT)

PROCEDURE (CONT)

9. Press and hold FAST INCR key until frequency counter stops counting.
10. Observe frequency counter display. It should indicate more than 108.027 MHz. If not, go to troubleshooting chart 2-1, sh 1.
11. Press Δ F key.

NOTE

Δ F key will extinguish.



TEST SET REAR VIEW

EL9LY012

12. Disconnect frequency counter from test set RF OUT jack and connect to COMP output (1) on rear panel.
13. Enter frequency 108.00 MHz into test set (VOR Mode).
14. Extinguish 30 VAR and 9960 FM TONE SELECT keys.
15. Press (to light) 9960 Hz TONE SELECT key.
16. Observe frequency counter display. It should indicate between 100.4006 and 100.4026 μs (9959.9009 and 9960.0991 Hz). If not, go to troubleshooting chart chart 2-1, sh 1.

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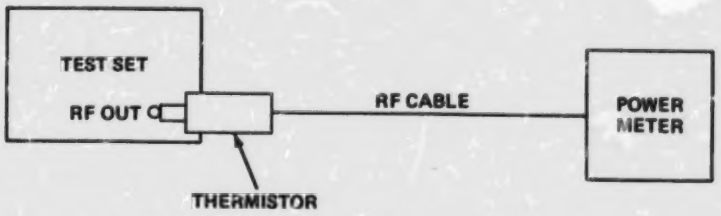
19.

2-6. FREQUENCY RESPONSE PERFORMANCE TEST.

TEST EQUIPMENT REQUIRED: Power Meter HP 432A with thermistor mount 478A
RF Cable RG-58/U

EQUIPMENT SETUP: Connect test set to 115 vac power source.
Connect power meter/sensor to test set as indicated in the following diagram.



EL9LY013

Turn equipment on. Allow at least 30 minutes for warmup.

PROCEDURE

1. Enter frequency 74.60 MHz into test set.
2. Set test set RF LEVEL to −6 dBmW.
3. Remove modulation by extinguishing all lit TONE SELECT keys.
4. Power meter should indicate −6 dBmW ± 0.5 dB. If not, go to troubleshooting chart 2-1, sh 7.
5. Repeat procedure at frequencies 75.00, 75.40, 108.00, 110.00, 111.95, 114.00, 116.00, 117.95, 329.15, 331.10, 333.50, and 335.00 MHz.

NOTE

Test set TONE SELECT keys must be extinguished after each frequency change.

2-7. OUTPUT ATTENUATOR ACCURACY PERFORMANCE TEST.

TEST EQUIPMENT REQUIRED: Same as Frequency Response Performance Test (para 2-6).

EQUIPMENT SETUP: Same as Frequency Response Performance Test (para 2-6).

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2-7. OUTPUT ATTENUATOR ACCURACY PERFORMANCE TEST. (CONT)

PROCEDURE

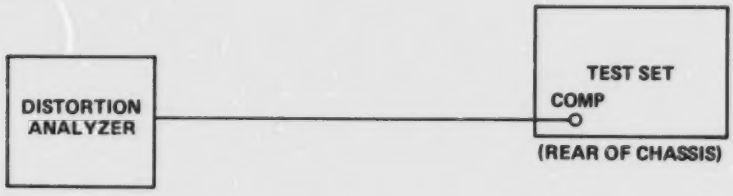
1. Enter frequency 108.00 MHz into test set.
2. Set test set RF LEVEL to −6 dBmW.
3. Remove modulation by extinguishing all TONE SELECT keys.
4. Record power meter indication. Power meter should indicate between −6 dBm ± 0.5 dBm. If not, go to troubleshooting chart 2-1, sh 7.
5. Set test set RF LEVEL to values listed below. Subtract level recorded in step 4 from each setting. The difference at each level should be within limits specified in the table. If not, go to troubleshooting chart 2-1, sh 7.

TEST SET RF LEVEL (dBmW)	ACCEPTABLE DIFFERENCE
-7	± 0.5 dBm
-8	± 0.5 dBm
-10	± 0.5 dBm
-14	± 0.5 dBm
-20	± 0.5 dBm

2-8. MODULATION TONE DISTORTION PERFORMANCE TEST.

TEST EQUIPMENT REQUIRED: Distortion Analyzer HP 334A-C41
RF Cable RG-58/U with BNC plug-to-double banana plug termination

EQUIPMENT SETUP: Connect test set to 115 vac power source.
Connect distortion analyzer to test set as indicated in the following diagram.



EL9LY014

Turn equipment on. Allow at least 30 minutes for warmup.

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21.

2-8. MODULATION TONE DISTORTION PERFORMANCE TEST. (CONT)

PROCEDURE

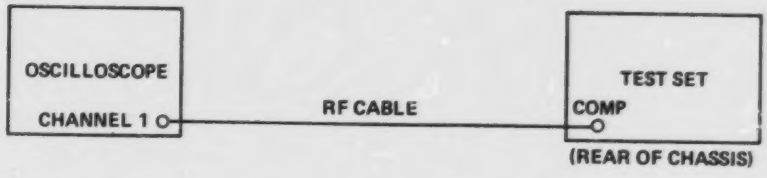
1. Enter frequency 108.00 MHz into test set.
2. 30 Hz VAR TONE SELECT key is lit. Extinguish all other TONE SELECT keys.
3. Distortion analyzer should indicate 0.25 percent or less distortion. If not, go to troubleshooting chart 2-1, sh 7.
4. Enter carrier frequencies and set accompanying modulating (TONE SELECT) frequencies as listed in the following table. At each setting, check distortion analyzer indication against distortion limits listed in table next to appropriate frequencies. If distortion analyzer indication is above limit at any setting, go to troubleshooting chart 2-1, sh 7.

CARRIER FREQUENCY (MHz)	TONE SELECT FREQUENCY (Hz)	MAXIMUM DISTORTION (%)
108.00	1020	0.5
108.00	9960	0.5
108.10	90	0.25
108.10	150	0.25
75.00	400	1.0
75.00	1300	1.0
75.00	3000	1.0

2-9. 9960 FM DEVIATION PERFORMANCE TEST.

TEST EQUIPMENT REQUIRED: Oscilloscope TEK R5440 with plug-ins 5A48 and 5B42
RF Cable RG-58/U

EQUIPMENT SETUP: Connect test set to 115 vac power source.
Connect oscilloscope to test set as indicated in the following diagram.



EL9LY015

Turn on test equipment. Allow at least 30 minutes for warmup.

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2-9. 9960 FM DEVIATION PERFORMANCE TEST. (CONT)

PROCEDURE

1. Enter frequency 108.00 MHz into test set.
2. 9960 FM TONE SELECT key is lit. Extinguish all other TONE SELECT keys.
3. Set oscilloscope controls as follows:

   TIME BASE: Division A, 0.1 ms; Division B, 10 μs
   VERT: 0.5 volts/div

4. Center sine wave on oscilloscope and adjust trigger level control to start sine wave at horizontal graticule centerline.
5. Adjust oscilloscope delay time multiplier control so that fifth cycle is displayed.
6. Press oscilloscope B DLYD pushbutton. Width of jitter at end of fifth cycle should be between 46.1 and 50.9 μs. If not, go to troubleshooting chart 2-1, sh 8.

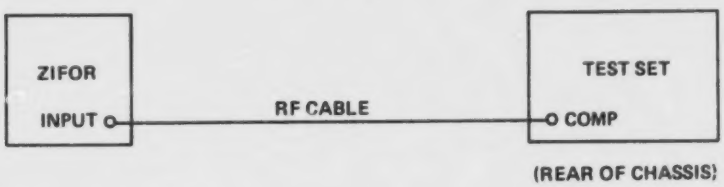
NOTE

The width of the jitter is proportional to the 9960 Hz FM. A 9960 Hz signal deviation ± 480 Hz varies between 9480 and 10,440 Hz. The period of 10,440 Hz is 15.785 μs and the time for five cycles is 478.925 μs. The period of 9480 Hz is 105.485 μs and the time for five cycles is 527.425 μs. The difference between them (527.425 μs minus 478.925 μs) is 48.5 μs. For a tolerance of 480 Hz ± 5 percent deviation, the width of the jitter must be 48.5 μs ± 5 percent (+ 2.4 μs).

2-10. VOR RADIAL ACCURACY PERFORMANCE TEST.

TEST EQUIPMENT REQUIRED: RF Cable RG-58/U
Zifor, Collins Model 478A3

EQUIPMENT SETUP: Connect test set to 115 vac power source.
Connect zifor to test set as indicated in the following diagram.



EL9LY016

Turn on equipment. Allow at least 30 minutes for warmup.

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2-10. VOR RADIAL ACCURACY PERFORMANCE TEST. (CONT)

PROCEDURE

1. Enter frequency 116.00 MHz into test set.
2. 30 Hz VAR and 9960 FM TONE SELECT keys are lit. All other TONE SELECT keys are off.
3. Set RDL/DDM/MOD display to 000.00 RDL (DEG).

NOTE

RDL/DDM/MOD display provides a FROM indication.

4. Zifor indications will be 359.98 to 0.02 degrees radial. If not, go to troubleshooting chart 2-1, sh 8.
5. Set test set RDL/DDM/MOD display to the radial settings listed in the following table. At each radial setting, zifor indication should fall within appropriate levels. If not, go to troubleshooting chart 2-1, sh 8.

RDL/DDM/MOD SETTING (DEGREES)	RADIAL ACCURACY	
	MIN ZIFOR INDICATION	MAX ZIFOR INDICATION
030.00	029.98	030.02
060.00	059.98	060.02
090.00	089.98	090.02
120.00	119.98	120.02
150.00	149.98	150.02
180.00	179.98	180.02
210.00	209.98	210.02
240.00	239.98	240.02
270.00	269.98	270.02
300.00	299.98	300.02
330.00	329.98	330.02
001.11	001.09	001.13

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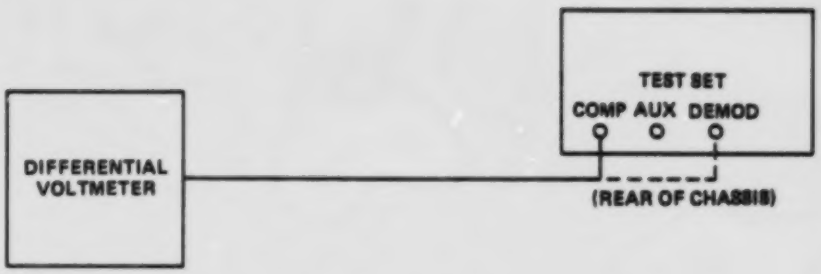
2-11. LOC DDM PERFORMANCE TEST.

TEST EQUIPMENT REQUIRED: Decade Resistor, Windslow 338
Differential Voltmeter, Fluke 887AB/AN
RF Cables, RG-58/U with BNC plug-to-double banana plug terminations and RG-58/U with double banana plug terminations

EQUIPMENT SETUP: Connect test set to 115 vac power source.
Connect differential voltmeter to test set as indicated in the following diagram.



EL9LY017

Turn on test equipment. Allow at least 30 minutes for warmup.

PROCEDURE

1. Enter frequency 108.10 MHz into test set.
2. Extinguish 150 Hz TONE SELECT key and record 90-Hz differential voltmeter indication.
3. Extinguish 90 Hz TONE SELECT key and press (to light) 150 Hz TONE SELECT key.
4. Record 150-Hz differential voltmeter indication.
5. Divide value recorded in step 4 by value recorded in step 2. Resulting voltage ratio should be between 0.99950 and 1.00050. If not, go to troubleshooting chart 2-1, sh 9.
6. Disconnect differential voltmeter from test set COMP connector and connect to DEMOD connector.
7. Extinguish 150 Hz TONE SELECT key and press (to light) 90 Hz TONE SELECT key.
8. Record differential voltmeter indication.
9. Extinguish 90 Hz TONE SELECT key and press (to light) 150 Hz TONE SELECT key.
10. Record differential voltmeter indication.
11. Divide the value recorded in step 10 by value recorded in step 8. Resulting voltage ratio should be between 0.99950 and 1.00050. If not, go to troubleshooting chart 2-1, sh 9.
12. Disconnect differential voltmeter from test DEMOD connector.
13. Connect equipment as indicated in the following diagram.

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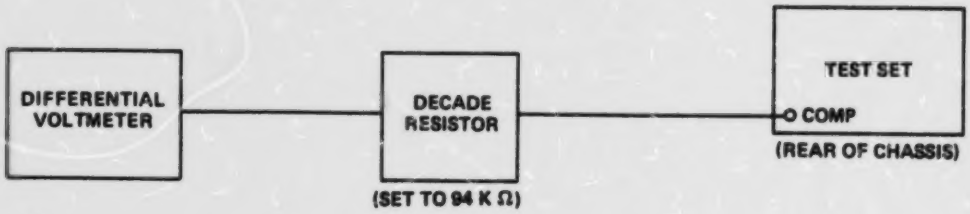
2-11. LOC DDM PERFORMANCE TEST. (CONT)



EL9LY018

14. Extinguish 150 Hz TONE SELECT key and press (to light) 90 Hz TONE SELECT key.
15. Press and release STEP ΔRDL ΔDDM FUNCTION/CONTROL key. RDL/DDM/MOD display will indicate .046.
16. Record differential voltmeter indication.
17. Extinguish 90 Hz TONE SELECT key and press (to light) 150 Hz TONE SELECT key.
18. Record differential voltmeter indication.
19. Divide recorded value in step 18 by value recorded in step 16. Resulting voltage ratio should be between 1.25861 and 1.26116. If not, go to troubleshooting chart 2-1, sh 9.
20. Extinguish 150 Hz TONE SELECT key and press (to light) 90 Hz TONE SELECT key.
21. Press and release STEP ΔRDL ΔDDM FUNCTION/CONTROL key. RDL/DDM/MOD display will indicate .093.
22. Record differential voltmeter indication.
23. Extinguish 90 Hz TONE SELECT key and press (to light) 150 Hz TONE SELECT key.
24. Record differential voltmeter indication.
25. Divide recorded value in step 24 by value recorded in step 22. Resulting voltage ratio should be between 1.60417 and 1.60756. If not, go to troubleshooting chart 2-1, sh 9.
26. Extinguish 150 Hz TONE SELECT key and press (to light) 90 Hz TONE SELECT key.
27. Press and release STEP ΔRDL ΔDDM FUNCTION/CONTROL key. RDL/DDM/MOD display will indicate .155.
28. Record differential voltmeter indication.
29. Extinguish 90 Hz TONE SELECT key and press (to light) 150 Hz TONE SELECT key.
30. Record differential voltmeter indication.
31. Divide recorded value in step 30 by recorded value in step 28. Resulting voltage ratio should be between 2.26264 and 2.26797. If not, go to troubleshooting chart 2-1, sh 9.
32. Extinguish 150 Hz TONE SELECT key and press (to light) 90 Hz TONE SELECT key.
33. Press and release STEP ΔRDL ΔDDM FUNCTION/CONTROL key. RDL/DDM/MOD display will indicate .200.
34. Record differential voltmeter indication.
35. Extinguish 90 Hz TONE SELECT key and press (to light) 150 Hz TONE SELECT key.
36. Record differential voltmeter indication.
37. Divide recorded value in step 36 by value recorded in step 34. Resulting voltage ratio should be between 2.99600 and 3.00400. If not, go to troubleshooting chart 2-1, sh 9.
38. Press STD FUNCTION/CONTROL key.
39. Press STEP ΔRDL ΔDDM FUNCTION/CONTROL key.
40. Press T/F U/L D/R FUNCTION/CONTROL key.

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26.

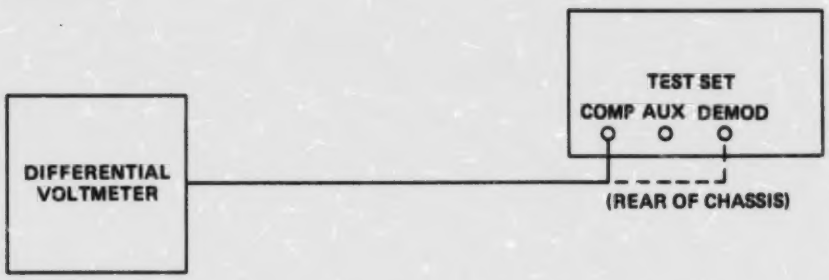
2-11. LOC DDM PERFORMANCE TEST. (CONT)

41. Extinguish 150 Hz TONE SELECT key, 90 Hz TONE SELECT key is lit.
42. Record differential voltmeter indication.
43. Extinguish 90 Hz TONE SELECT key and press (to light) 150 Hz TONE SELECT key.
44. Record differential voltmeter indication.
45. Divide recorded value in step 42 by value recorded in step 44. Resulting voltage ratio should be between 1.25861 and 1.26116. If not, go to troubleshooting chart 2-1, sh 9.
46. Repeat steps 20 through 24.
47. Divide recorded value in step 22 by value recorded in step 24. Resulting voltage ratio should be between 1.60417 and 1.60756. If not, go to troubleshooting chart 2-1, sh 9.
48. Repeat steps 26 through 30.
49. Divide recorded value in step 28 by value recorded in step 30. Resulting voltage ratio should be between 2.26264 and 2.26797. If not, go to troubleshooting chart 2-1, sh 9.
50. Repeat steps 32 through 36.
51. Divide recorded value in step 34 by value recorded in step 36. Resulting voltage ratio should be between 2.99600 and 3.00400. If not, go to troubleshooting chart 2-1, sh 9.

2-12. GLIDE SLOPE DDM PERFORMANCE TEST.

TEST EQUIPMENT REQUIRED: Decade Resistor, Windslow 336
Differential Voltmeter, Fluke 887AB/AN
RF Cables, RG-58/U with BNC plug-to-double banana plug terminations and RG-58/U with double banana plug terminations

EQUIPMENT SETUP: Connect test set to 115 vac power source.
Connect differential voltmeter to test set as indicated in the following diagram.



EL9LY019

Turn on test set. Allow at least 30 minutes for warmup.

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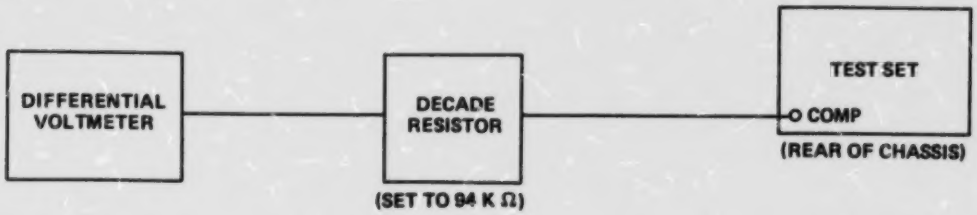
2-12. GLIDE SLOPE DDM PERFORMANCE TEST. (CONT)

PROCEDURE

1. Enter frequency 335.00 MHz into test set.
2. Extinguish 150 Hz TONE SELECT key and record 90-Hz differential voltmeter indication. (If 90 Hz key not lit, press to light.)
3. Extinguish 90 Hz TONE SELECT key and press (to light) 150 Hz TONE SELECT key.
4. Record 150-Hz differential voltmeter indication.
5. Divide value recorded in step 2 by value recorded in step 4. Resulting voltage ratio should be between 0.99975 and 1.00025. If not, go to troubleshooting chart 2-1, sh 9.
6. Disconnect differential voltmeter from test set COMP connector and connect to DEMOD connector.
7. Repeat steps 2 through 5. Voltage ratio should be between 0.99745 and 1.00255. If not, go to troubleshooting chart 2-1, sh 9.
8. Disconnect differential voltmeter from test set DEMOD connector.
9. Connect equipment as indicated in the following diagram.



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10. Press and release STEP Δ RDL ΔDDM FUNCTION/CONTROL key. RDL/DDM/MOD display will indicate .045.
11. Extinguish 150 Hz TONE SELECT key and press (to light) 90 Hz TONE SELECT key. Record 90-Hz differential voltmeter indication.
12. Extinguish 90 Hz key and press (to light) 150 Hz key.
13. Record 150-Hz differential voltmeter indication.
14. Divide value recorded in step 13 by value recorded in step 11. Resulting voltage ratio should be between 1.11864 and 1.11979. If not, go to troubleshooting chart 2-1, sh 9.
15. Press and release STEP ΔRDL ΔDDM FUNCTION/CONTROL key. RDL/DDM/MOD display will indicate .091.
16. Repeat steps 11, 12, and 13. Divide value recorded in step 13 by value recorded in step 11. Voltage ratio should be between 1.25606 and 1.25733. If not, go to troubleshooting chart 2-1, sh 9.
17. Press and release STEP ΔRDL ΔDDM FUNCTION/CONTROL key. RDL/DDM/MOD display will indicate .175.
18. Repeat steps 11, 12, and 13. Divide value recorded in step 13 by value recorded in step 11. Voltage ratio should be between 1.55918 and 1.56082. If not, go to troubleshooting chart 2-1, sh 9.
19. Press and release STEP ΔRDL ΔDDM FUNCTION/CONTROL key. RDL/DDM/MOD display will indicate .400.
20. Repeat steps 11, 12, and 13. Divide value recorded in step 13 by value recorded in step 11. Resulting voltage ratio should be between 2.99800 and 3.00200. If not, go to troubleshooting chart 2-1, sh 9.

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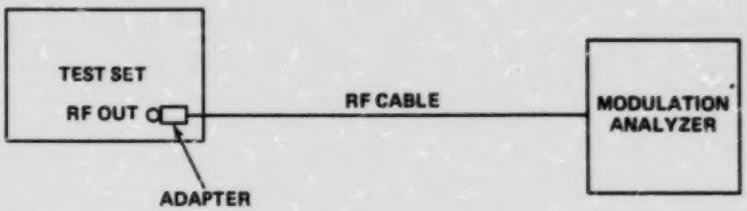
2-13. AM MODULATION PERFORMANCE TEST.

TEST EQUIPMENT REQUIRED: Adapter, N plug-to-BNC jack
Modulation Analyzer HP 8901
RF Cable RG-58/U

EQUIPMENT SETUP: Connect test set to 115 vac power source.
Connect modulation analyzer to test set as indicated in the following diagram.



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Turn on equipment. Allow at least 30 minutes for warmup.

PROCEDURE

1. Enter frequency 110.10 MHz into test set.
2. 90 Hz TONE SELECT key remains lit. Extinguish 150 Hz VAR TONE SELECT key.
3. Press (to light) % MOD FUNCTION/CONTROL key. RDL/DDM/MOD display indicates 20.0 MOD (%).
4. Reduce RF LEVEL TO −6 dB mW.
5. Observe modulation analyzer. If modulation analyzer does not indicate between 19.95 and 20.5 percent AM, go to troubleshooting chart 2-1, sh 10.
6. Press and release STD key.
7. Enter frequency 113.00 MHz into test set.
8. 30 Hz VAR TONE SELECT key is lit. Extinguish 9960 FM TONE SELECT key.
9. Press (to light) % MOD FUNCTION/CONTROL key. RDL/DDM/MOD display will indicate 30.0 MOD (%).
10. Observe modulation analyzer. If modulation analyzer does not indicate between 29.25 and 30.75 percent AM, go to troubleshooting chart 2-1, sh 10.
11. Extinguish 30 Hz VAR TONE SELECT key. Press (to light) 9960 Hz TONE SELECT key.
12. Observe modulation analyzer. If modulation analyzer does not indicate between 29.50 and 30.50 percent AM, go to troubleshooting chart 2-1, sh 10.
13. Enter frequency 332.00 MHz into test set.
14. 90 Hz TONE SELECT key is lit. Extinguish 30 Hz VAR TONE SELECT key.
15. Press (to light) % MOD FUNCTION/CONTROL key. RDL/DDM/MOD display will indicate 40.0 MOD (%).

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2-13. AM MODULATION PERFORMANCE TEST. (CONT)

16. Observe modulation analyzer. If it does not indicate between 39.90 and 40.10 percent, go to troubleshooting chart 2-1, sh 10.
17. Enter frequency 75.00 MHz into test set.
18. Select 1300 Hz TONE SELECT key.
19. Press (to light) % MOD FUNCTION/CONTROL key. RDL/DDM/MOD display will indicate 95.0 MOD (%).
20. Observe modulation analyzer. If modulation analyzer does not indicate between 94.90 and 95.10 percent AM, go to troubleshooting chart 2-1, sh 10.

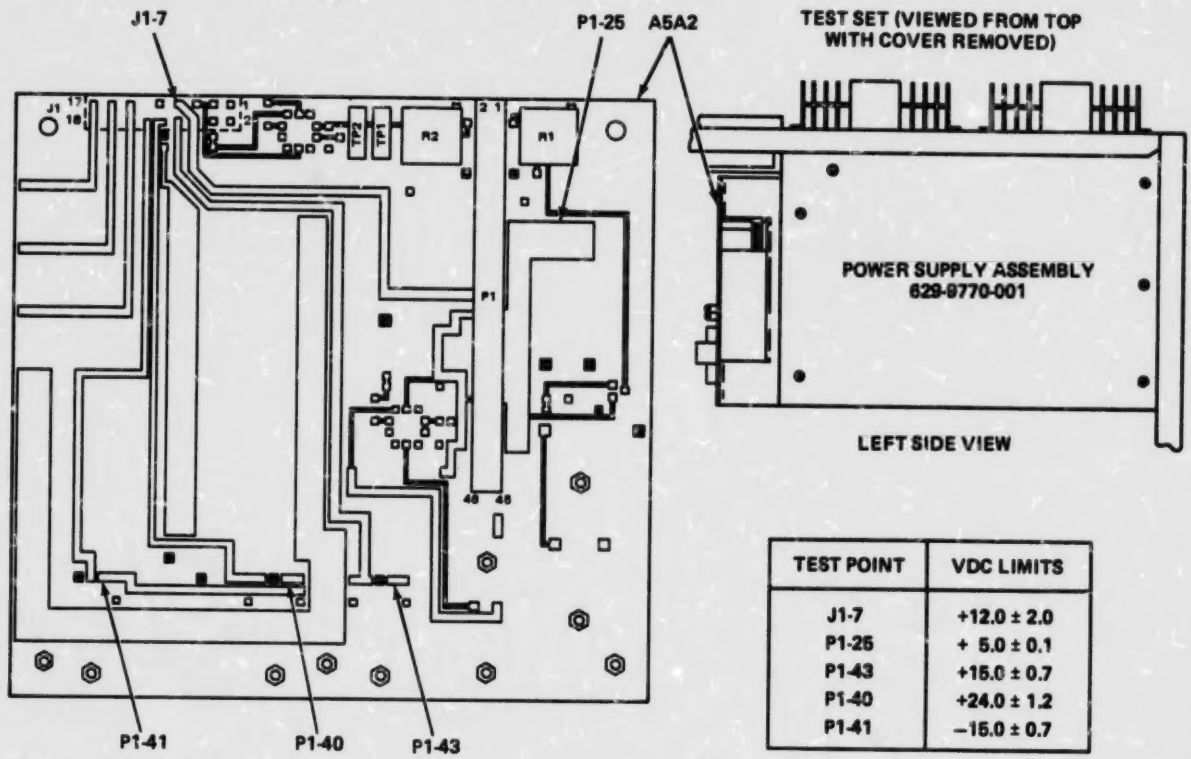
2-14. POWER SUPPLY PERFORMANCE TEST.

NOTE

Do not perform this test unless directed to do so by troubleshooting chart 2-1.

TEST EQUIPMENT REQUIRED: Digital Voltmeter HP 3490A

EQUIPMENT SETUP: Remove cover from test set (para 2-27).
Connect test set to 115 vac power source.



TEST POINT	VDC LIMITS
J1-7	+12.0 ± 2.0
P1-25	+ 5.0 ± 0.1
P1-43	+15.0 ± 0.7
P1-40	+24.0 ± 1.2
P1-41	−15.0 ± 0.7

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2-14. POWER SUPPLY PERFORMANCE TEST. (CONT)

Turn power (PWR) on. Allow at least 30 minutes for warmup.

PROCEDURE

1. Use voltmeter to check dc voltages at test points as shown in previous illustration.
2. If measured dc voltages are not within limits, go to troubleshooting chart 2-1, sh 10.

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Section III TROUBLESHOOTING

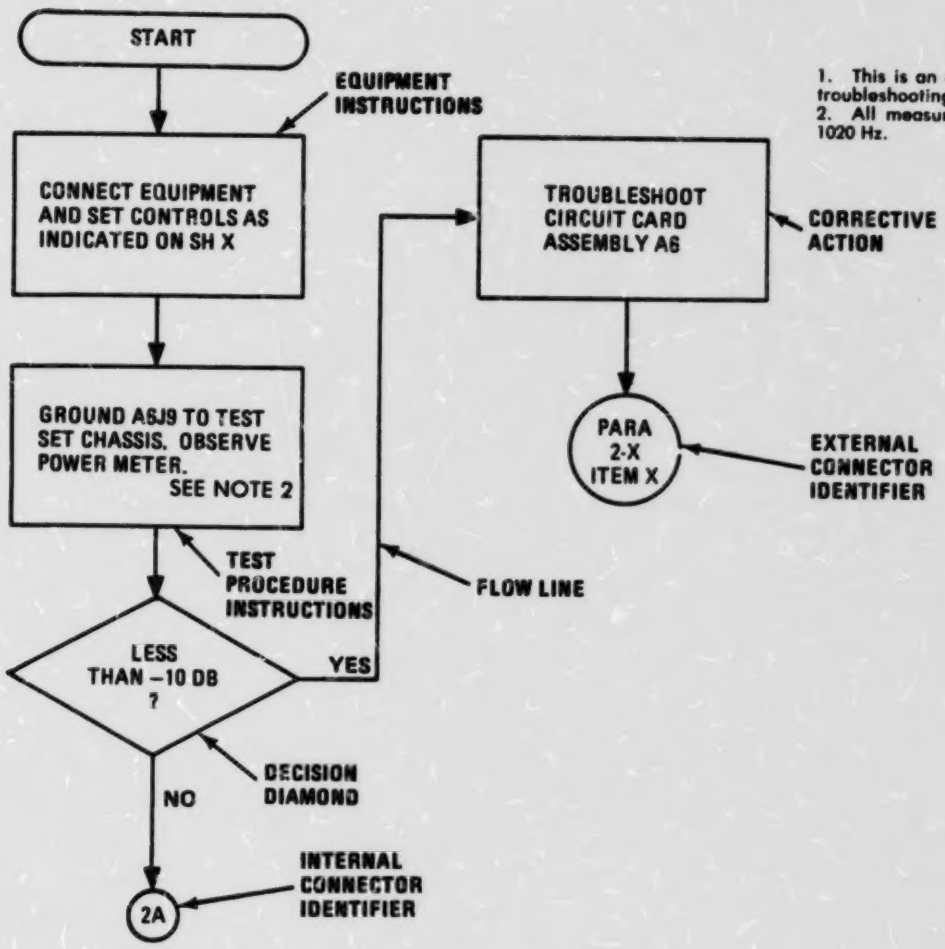
Subject	Para	Page
General	2-15	2-17
How to Use the Troubleshooting Charts	2-16	2-17
Troubleshooting Charts	2-17	2-19

2-15. GENERAL.

This section contains procedures that will assist the technician in troubleshooting the test set. The procedures are written as logic flow charts. Information covering the use of these charts is contained in paragraph 2-16.

The troubleshooting charts are designed to isolate faults in response to specific performance problems. Once the fault is isolated, the technician can then take corrective action by following the flow of the charts.

2-16. HOW TO USE THE TROUBLESHOOTING CHARTS.


START
EQUIPMENT INSTRUCTIONS
CONNECT EQUIPMENT AND SET CONTROLS AS INDICATED ON SH X
GROUND A6J9 TO TEST SET CHASSIS. OBSERVE POWER METER. SEE NOTE 2
TEST PROCEDURE INSTRUCTIONS
LESS THAN –10 DB ?
YES
NO
DECISION DIAMOND
FLOW LINE
TROUBLESHOOT CIRCUIT CARD ASSEMBLY A6
CORRECTIVE ACTION
PARA 2-X ITEM X
EXTERNAL CONNECTOR IDENTIFIER
2A
INTERNAL CONNECTOR IDENTIFIER
NOTES
1. This is an example on how to use the troubleshooting charts and notes.
2. All measurement checks distortion at 1020 Hz.

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2-16. HOW TO USE THE TROUBLESHOOTING CHARTS. (CONT)

The preceding illustration is an example of a logic flow chart. Refer to the illustration while reading the following information.

START

Each chart has a start segment, indicating the start of the troubleshooting procedure.

TEST PROCEDURE INSTRUCTIONS

Test procedure instructions appear in a rectangular box. These instructions usually contain specific test points to be probed.

DECISION DIAMOND

As a result of a particular test point probe, some electrical value should be observed, such as a voltage indication on a piece of test equipment. The decision diamond defines what value **should** be observed. and permits a **YES** or **NO** decision in response to what is observed.

TROUBLESHOOTING FLOW LINE

Troubleshooting flow lines provide direction to successive steps in the logic chart. An arrow at the end of each flow line indicates the next step in the troubleshooting chain.

CORRECTIVE ACTION OR ADDITIONAL INSTRUCTION

A corrective action box or additional instruction box always follows a decision diamond. If a test set response does not meet the standard set in the decision diamond, the appropriately marked flow line from the decision diamond will usually be followed to a corrective action box. If the test set response meets the standard, the flow line will be followed to an additional instruction box, which will either continue the troubleshooting procedure or refer to the next test in the sequence.

INTERNAL CONNECTOR IDENTIFIER

There are two sizes of circular identifiers used in the troubleshooting charts. The smaller of the two is the internal connector identifier. The internal connector identifier indicates a continuation of the procedure to another sheet in the same troubleshooting chart. The sheet on which the procedure is continued contains a corresponding identifier; that is, a small circle in which the same number is printed.

The number in the circle indicates on which sheet the test procedure continues. In the sample chart, for example, the **NO** branch of the decision diamond flows to an identifier containing a 2. This means that the procedure is continued on sheet 2, at the small circle containing 2. If there is more than one connector on a sheet, a letter will be added to the sheet number (ie, 1A).

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2-16. HOW TO USE THE TROUBLESHOOTING CHARTS. (CONT)

EXTERNAL CONNECTOR IDENTIFIER

The external connector is a large circle which references a paragraph outside the troubleshooting chart. In the sample illustration, page 2-17, the large circle contains para 2-x. This paragraph reference identifies the location of the A5 assembly replacement procedure, referred to in the preceding corrective action rectangle. This replacement procedure is not found within the troubleshooting chart. Thus, a large circle always references some information **external** to the flow chart.

NOTES

The third column on each troubleshooting sheet may contain notes used to clarify information contained in the troubleshooting chart.

2-17. TROUBLESHOOTING CHARTS.

The following logic flow chart is generated by initial adjustment, self-test, or operational check failure. Performance of the troubleshooting procedure results in the determination of the need for alinement or replacement of a test set assembly.

NOTE

If test set assembly A2, A3, A4, or A5 is replaced, the alinement procedures specified in the table on page 2-31 must be performed.

After any corrective action has been taken, the troubleshooting chart will instruct you to repeat all or part of the test sequence to ensure that the fault has been corrected.

NOTE

Before replacing any assembly, make sure that a loose wiring harness or cable connector is not causing the symptom. Also, verify the presence of supply voltages on suspected failed modules. Absence of supply voltage may indicate faulty wiring harness.

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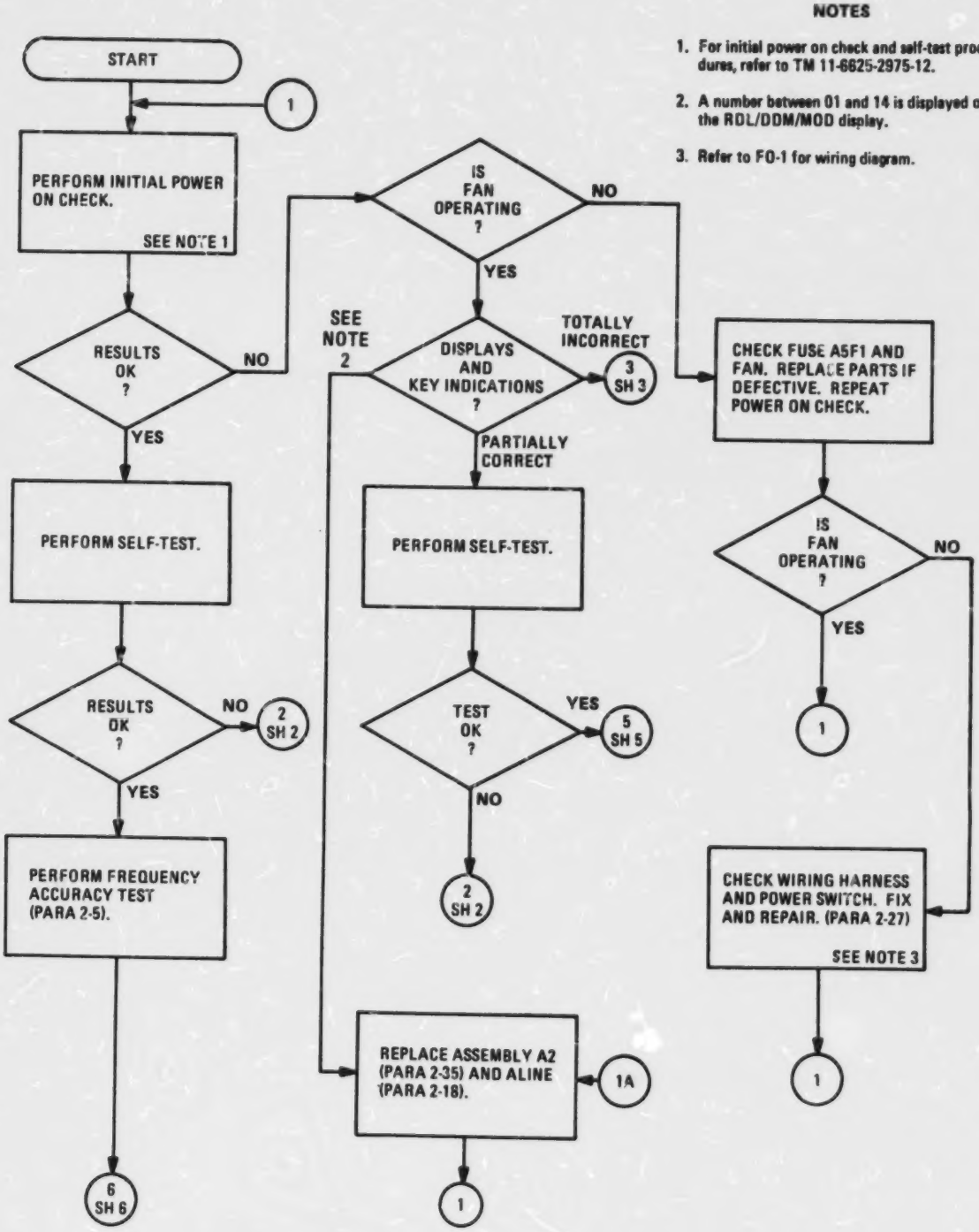
2-17. TROUBLESHOOTING CHARTS. (CONT)

CHART 2-1
Performance Test Failure Troubleshooting
(Sheet 1 of 11)



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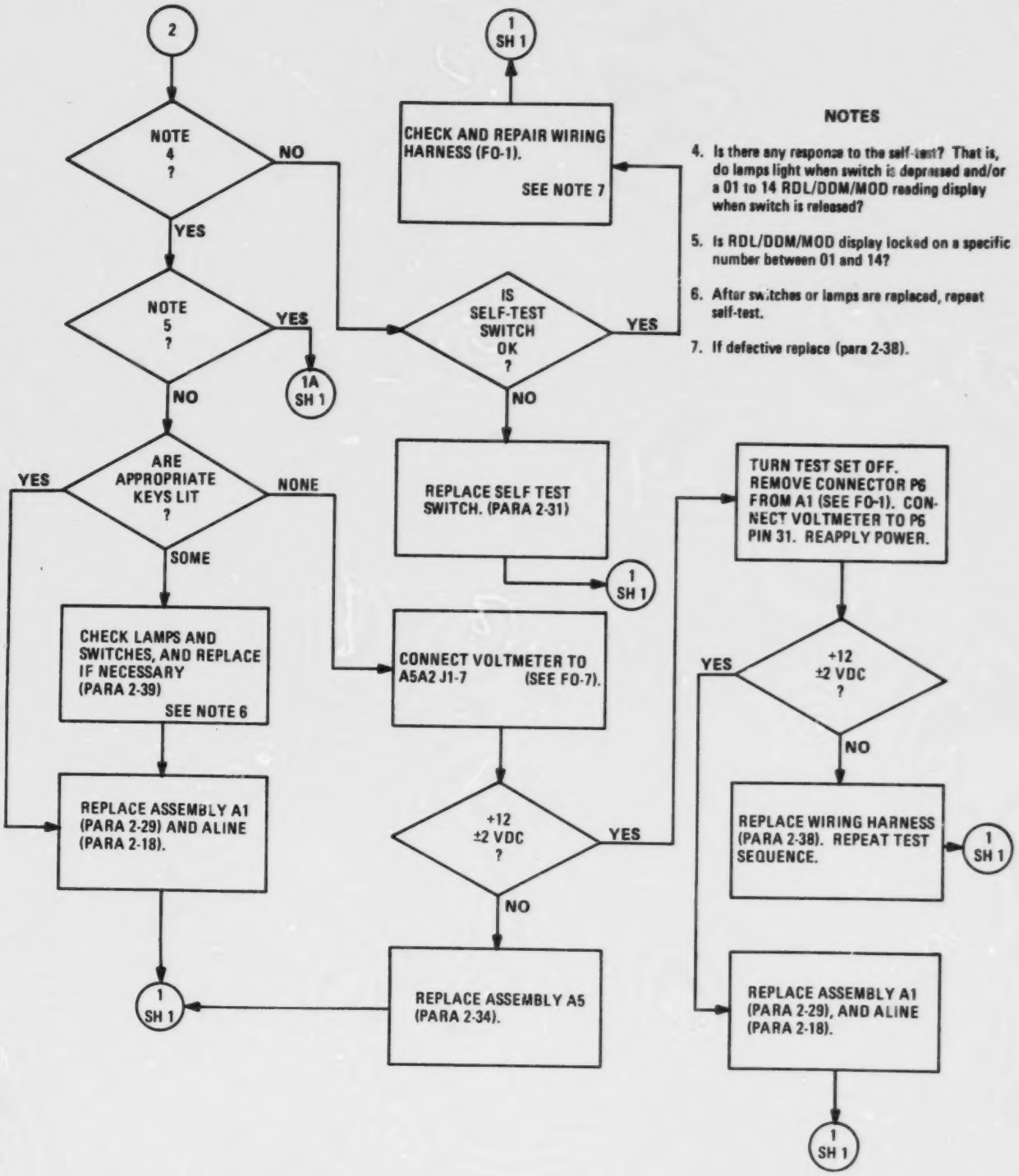
2-17. TROUBLESHOOTING CHARTS. (CONT)

CHART 2-1
Performance Test Failure Troubleshooting
(Sheet 2 of 11)


2
NOTE 4 ?
NO
YES
NOTE 5 ?
YES
1A SH 1
NO
ARE APPROPRIATE KEYS LIT ?
YES
NONE
SOME
CHECK LAMPS AND SWITCHES, AND REPLACE IF NECESSARY (PARA 2-39) SEE NOTE 6
REPLACE ASSEMBLY A1 (PARA 2-29) AND ALINE (PARA 2-18).
1 SH 1
1 SH 1
CHECK AND REPAIR WIRING HARNESS (FO-1). SEE NOTE 7
IS SELF-TEST SWITCH OK ?
YES
NO
REPLACE SELF TEST SWITCH. (PARA 2-31)
1 SH 1
CONNECT VOLTMETER TO A5A2 J1-7 (SEE FO-7).
+12 ±2 VDC ?
YES
NO
REPLACE ASSEMBLY A5 (PARA 2-34).
TURN TEST SET OFF. REMOVE CONNECTOR P6 FROM A1 (SEE FO-1). CONNECT VOLTMETER TO P6 PIN 31. REAPPLY POWER.
+12 ±2 VDC ?
YES
NO
REPLACE WIRING HARNESS (PARA 2-38). REPEAT TEST SEQUENCE.
1 SH 1
REPLACE ASSEMBLY A1 (PARA 2-29), AND ALINE (PARA 2-18).
1 SH 1

NOTES

4. Is there any response to the self-test? That is, do lamps light when switch is depressed and/or a 01 to 14 RDL/DDM/MOD reading display when switch is released?
5. Is RDL/DDM/MOD display locked on a specific number between 01 and 14?
6. After switches or lamps are replaced, repeat self-test.
7. If defective replace (para 2-38).

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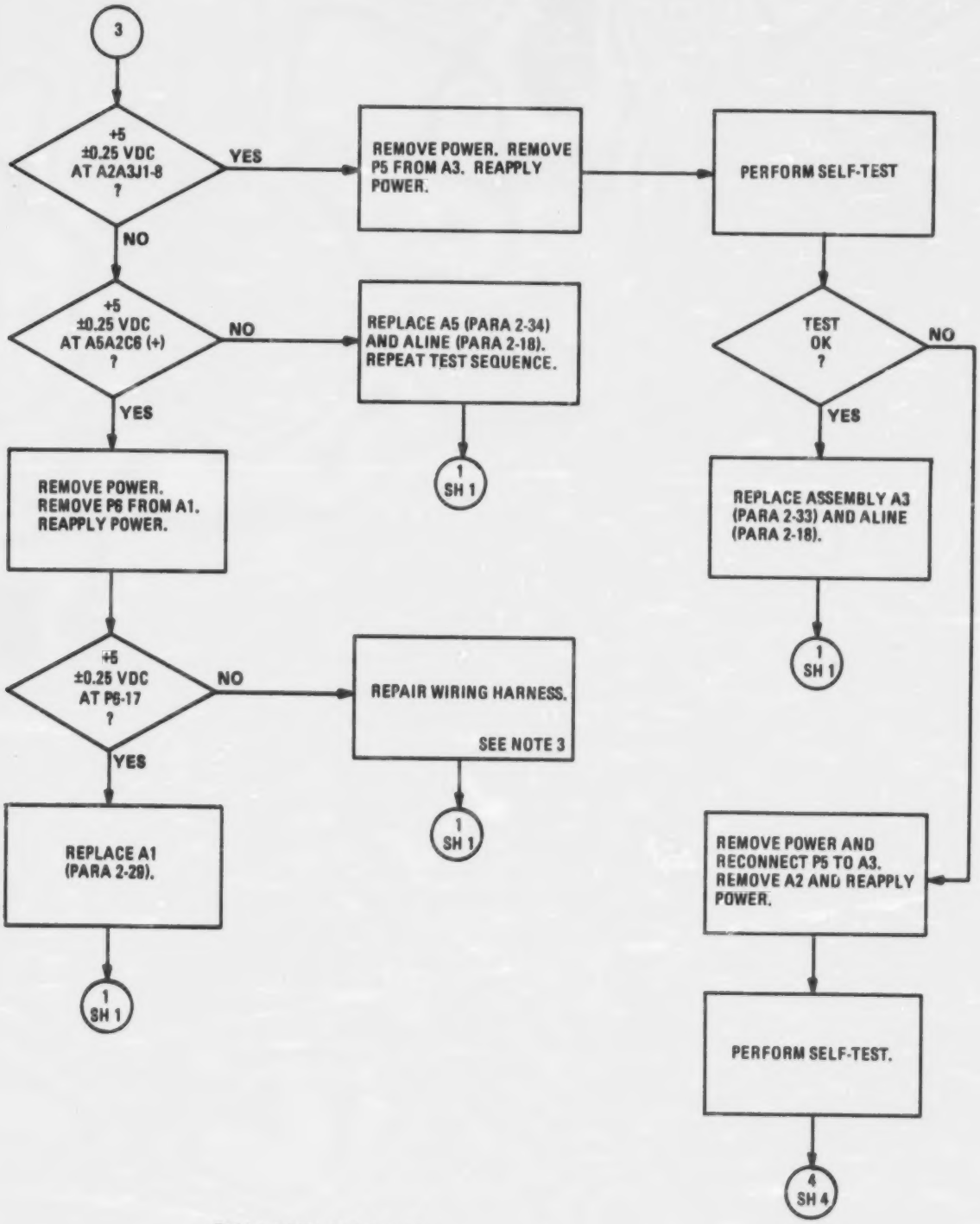
2-17. TROUBLESHOOTING CHARTS. (CONT)

CHART 2-1
Performance Test Failure Troubleshooting
(Sheet 3 of 11)



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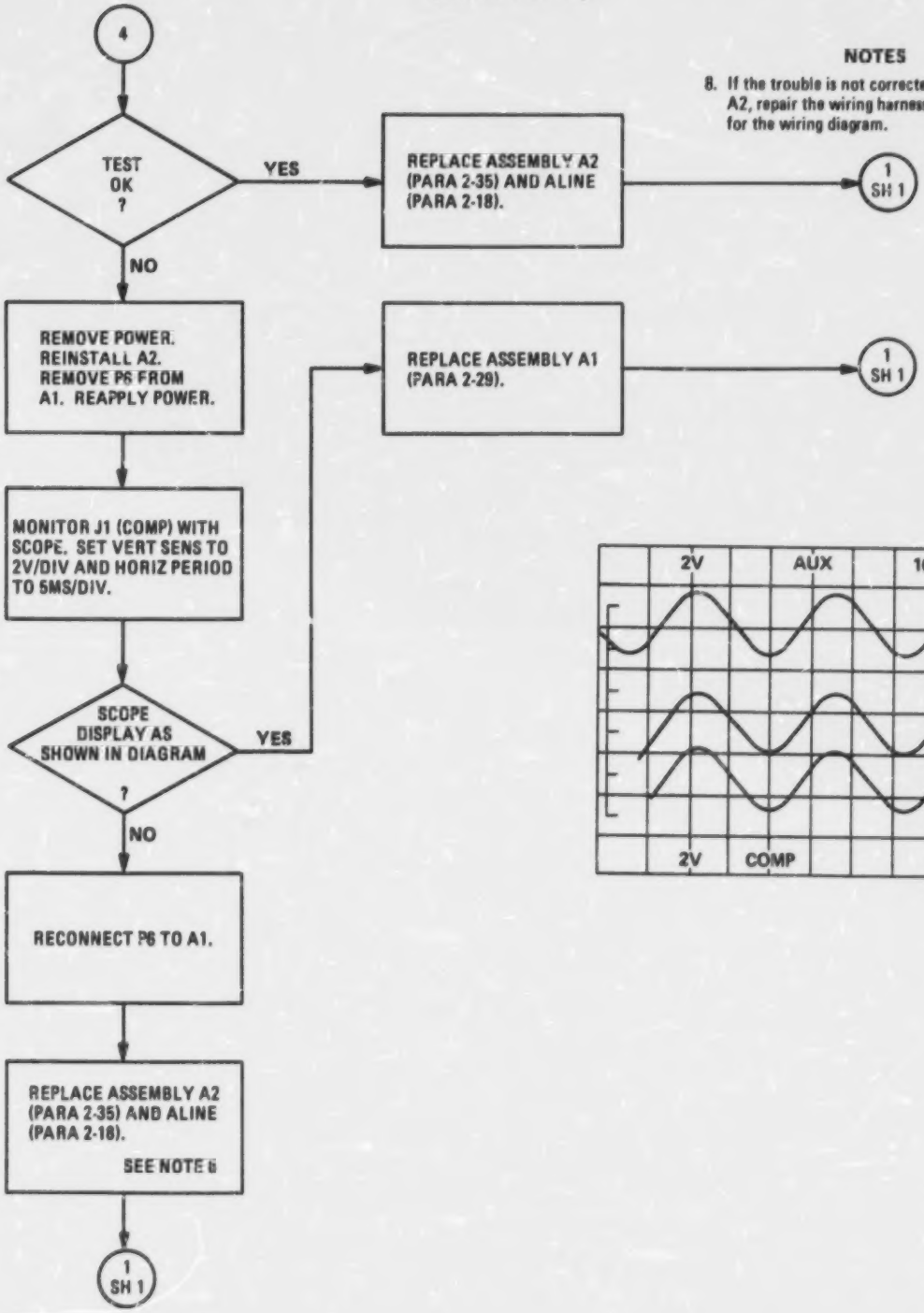
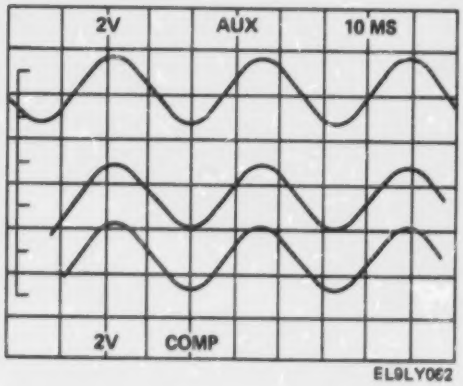
2-17. TROUBLESHOOTING CHARTS. (CONT)

CHART 2-1
Performance Test Failure Troubleshooting
(Sheet 4 of 11)


4
TEST OK ?
YES
NO
REPLACE ASSEMBLY A2 (PARA 2-35) AND ALINE (PARA 2-18).
1 SH 1
REMOVE POWER. REINSTALL A2. REMOVE P6 FROM A1. REAPPLY POWER.
REPLACE ASSEMBLY A1 (PARA 2-29).
1 SH 1
MONITOR J1 (COMP) WITH SCOPE. SET VERT SENS TO 2V/DIV AND HORIZ PERIOD TO 5MS/DIV.
SCOPE DISPLAY AS SHOWN IN DIAGRAM ?
YES
NO
RECONNECT P6 TO A1.
REPLACE ASSEMBLY A2 (PARA 2-35) AND ALINE (PARA 2-18).
SEE NOTE 8
1 SH 1

NOTES

8. If the trouble is not corrected after replacing A2, repair the wiring harness. Refer to FO-1 for the wiring diagram.



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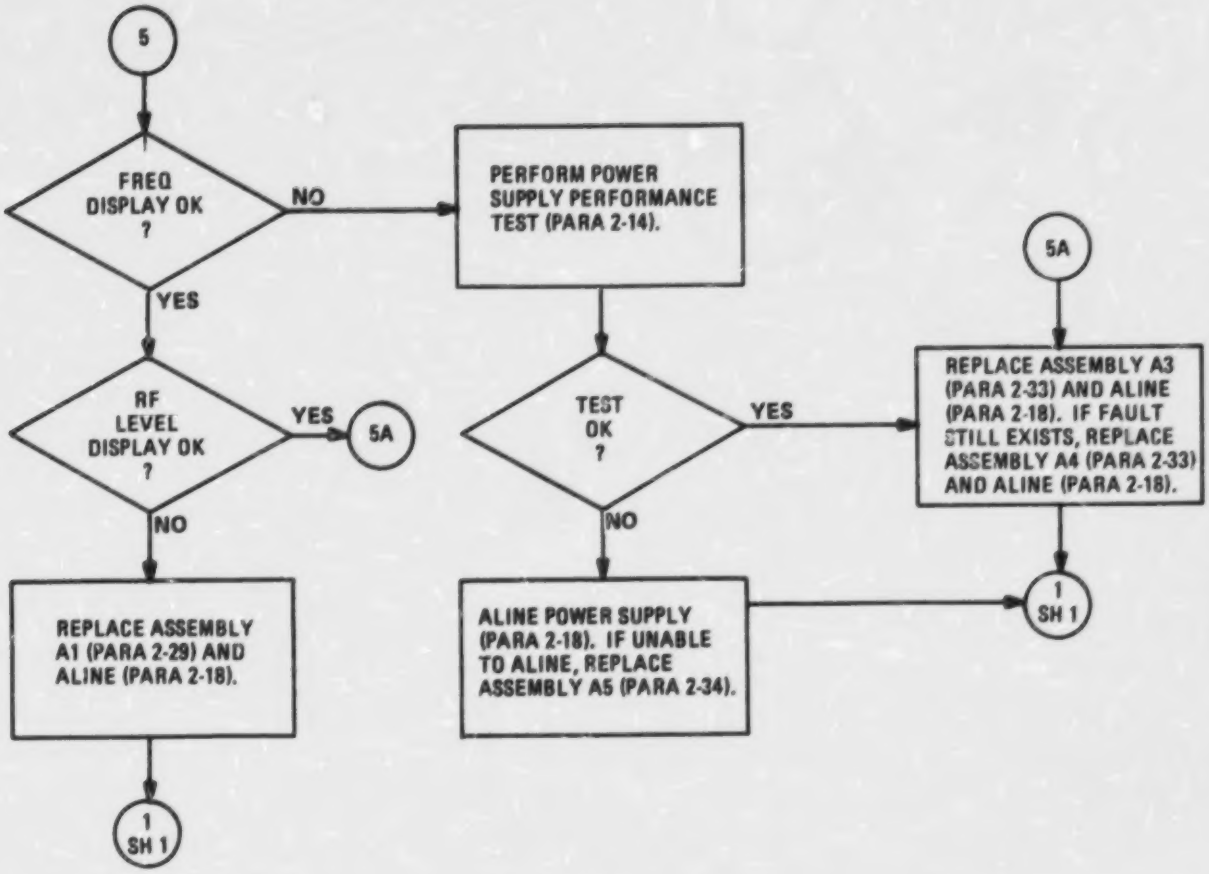
2-17. TROUBLESHOOTING CHARTS. (CONT)

CHART 2-1
Performance Test Failure Troubleshooting
(Sheet 5 of 11)


5
FREQ DISPLAY OK ?
NO
PERFORM POWER SUPPLY PERFORMANCE TEST (PARA 2-14).
YES
RF LEVEL DISPLAY OK ?
YES
5A
NO
REPLACE ASSEMBLY A1 (PARA 2-29) AND ALINE (PARA 2-18).
1 SH 1
TEST OK ?
YES
NO
ALINE POWER SUPPLY (PARA 2-18). IF UNABLE TO ALINE, REPLACE ASSEMBLY A5 (PARA 2-34).
5A
REPLACE ASSEMBLY A3 (PARA 2-33) AND ALINE (PARA 2-18). IF FAULT STILL EXISTS, REPLACE ASSEMBLY A4 (PARA 2-33) AND ALINE (PARA 2-18).
1 SH 1

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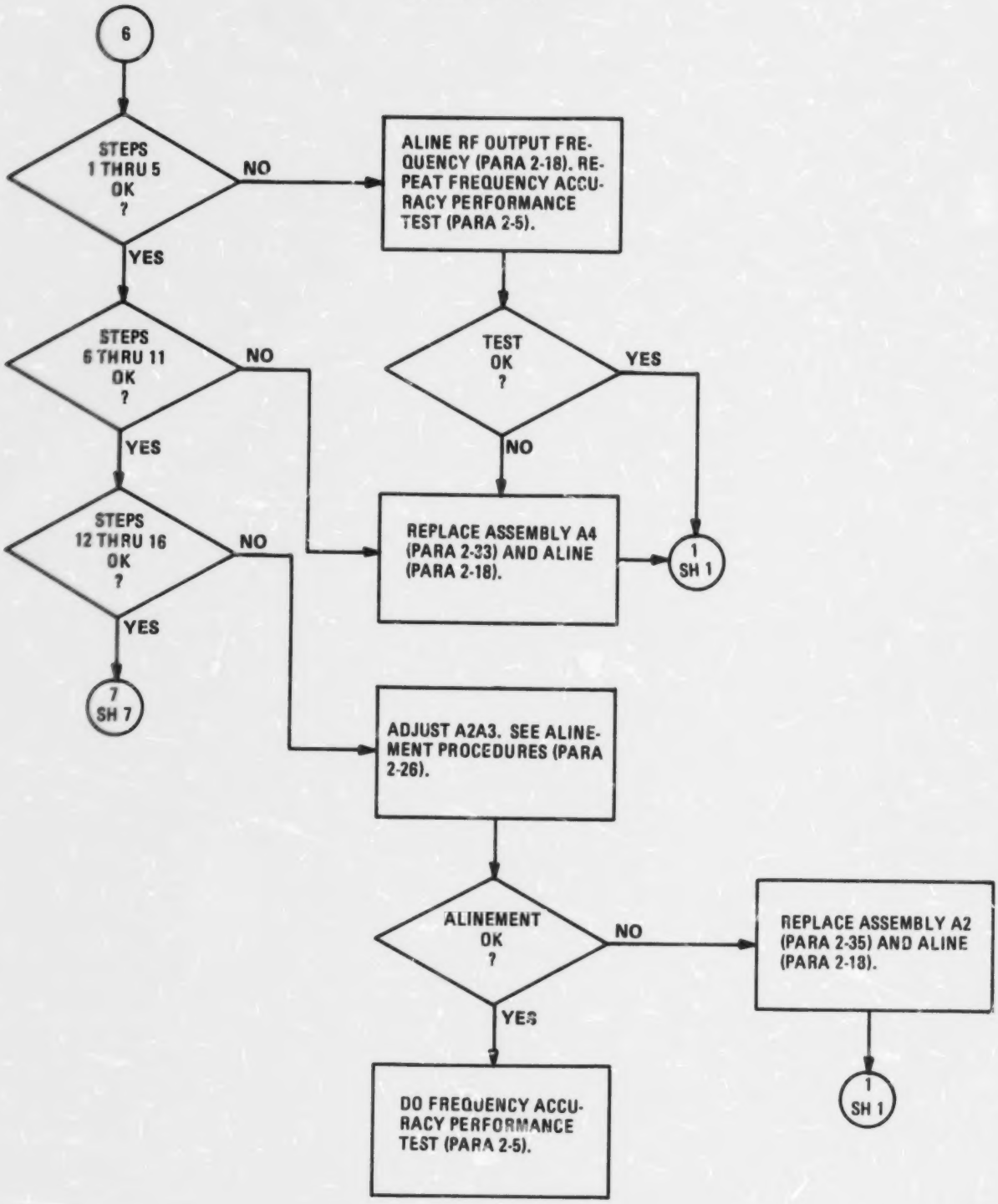
2-17. TROUBLESHOOTING CHARTS. (CONT)

CHART 2-1
Performance Test Failure Troubleshooting
(Sheet 6 of 11)



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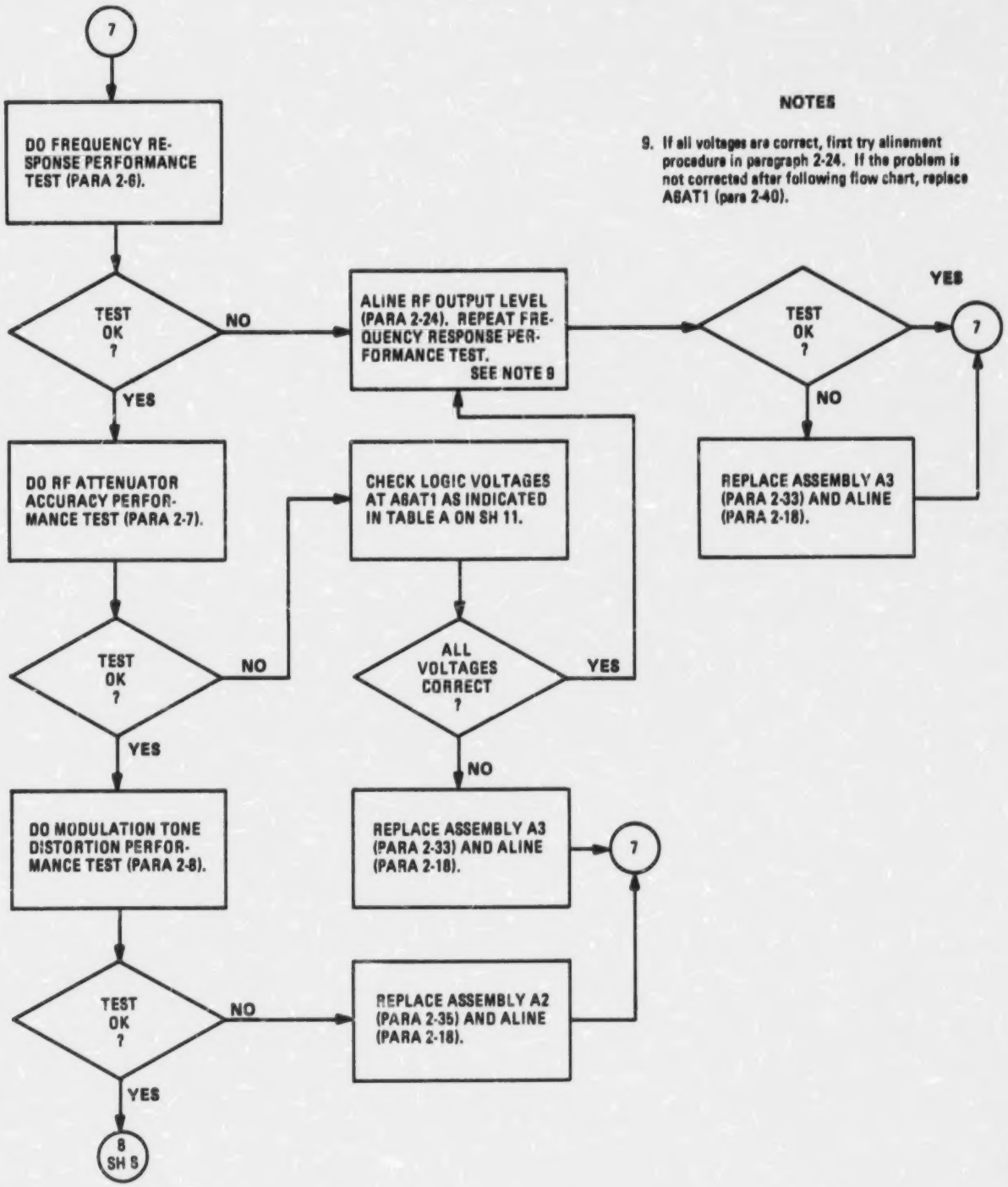
2-17. TROUBLESHOOTING CHARTS. (CONT)

CHART 2-1
Performance Test Failure Troubleshooting
(Sheet 7 of 11)


7
DO FREQUENCY RESPONSE PERFORMANCE TEST (PARA 2-6).
TEST OK ?
NO
YES
ALINE RF OUTPUT LEVEL (PARA 2-24). REPEAT FREQUENCY RESPONSE PERFORMANCE TEST. SEE NOTE 9
TEST OK ?
YES
7
NO
REPLACE ASSEMBLY A3 (PARA 2-33) AND ALINE (PARA 2-18).
DO RF ATTENUATOR ACCURACY PERFORMANCE TEST (PARA 2-7).
CHECK LOGIC VOLTAGES AT A6AT1 AS INDICATED IN TABLE A ON SH 11.
TEST OK ?
NO
YES
ALL VOLTAGES CORRECT ?
YES
NO
DO MODULATION TONE DISTORTION PERFORMANCE TEST (PARA 2-8).
REPLACE ASSEMBLY A3 (PARA 2-33) AND ALINE (PARA 2-18).
7
TEST OK ?
NO
REPLACE ASSEMBLY A2 (PARA 2-35) AND ALINE (PARA 2-18).
YES
8 SH 8
NOTES
9. If all voltages are correct, first try alinement procedure in paragraph 2-24. If the problem is not corrected after following flow chart, replace A6AT1 (para 2-40).

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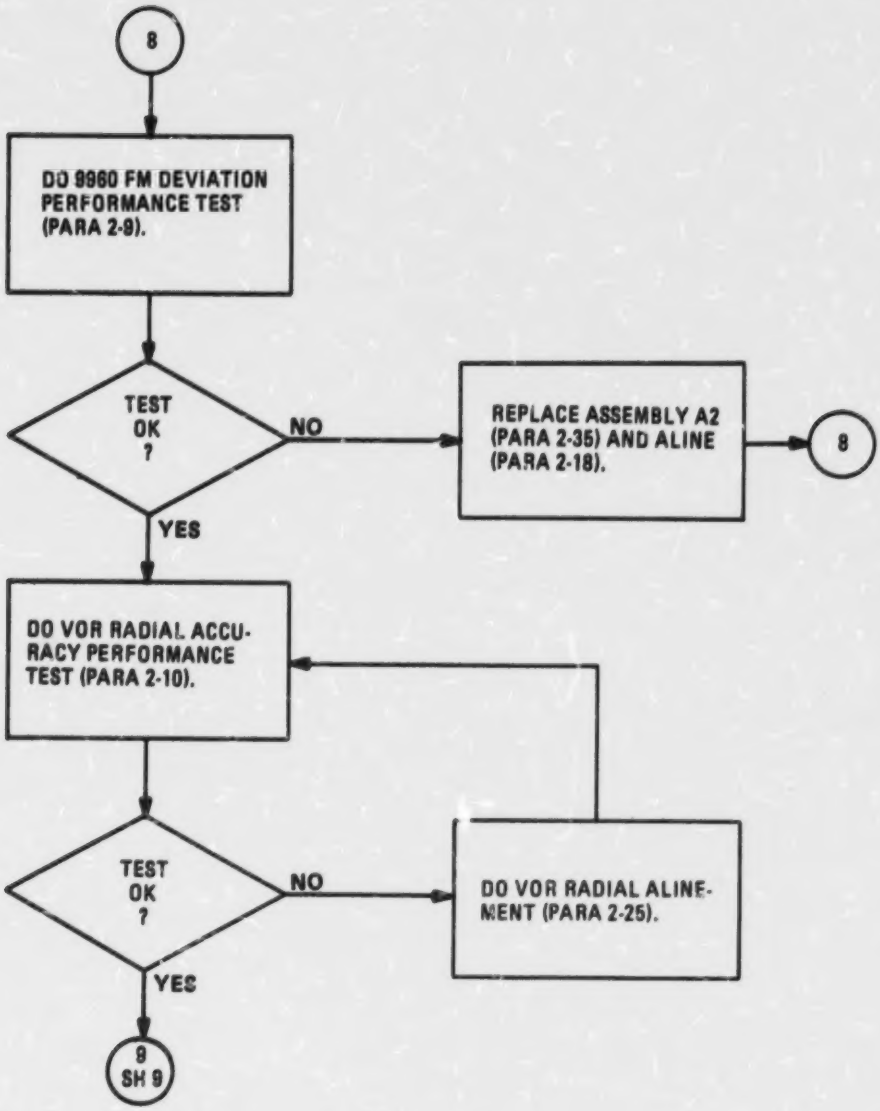
2-17. TROUBLESHOOTING CHARTS. (CONT)

CHART 2-1
Performance Test Failure Troubleshooting
(Sheet 8 of 11)



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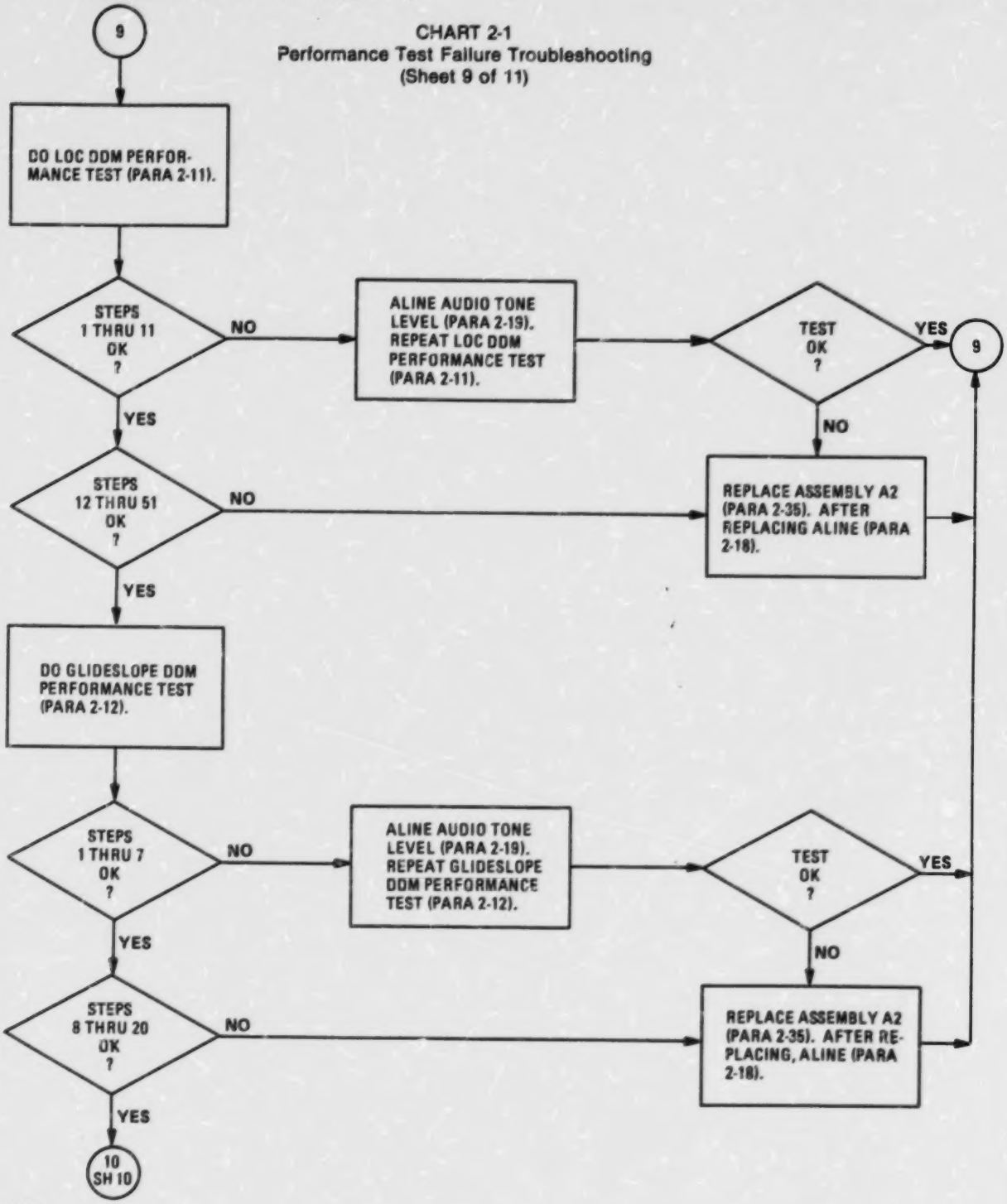
2-17. TROUBLESHOOTING CHARTS. (CONT)

CHART 2-1
Performance Test Failure Troubleshooting
(Sheet 9 of 11)


9
DO LOC DDM PERFORMANCE TEST (PARA 2-11).
STEPS 1 THRU 11 OK ?
NO
ALINE AUDIO TONE LEVEL (PARA 2-19). REPEAT LOC DDM PERFORMANCE TEST (PARA 2-11).
TEST OK ?
YES
9
NO
YES
STEPS 12 THRU 51 OK ?
NO
REPLACE ASSEMBLY A2 (PARA 2-35). AFTER REPLACING ALINE (PARA 2-18).
YES
DO GLIDESLOPE DDM PERFORMANCE TEST (PARA 2-12).
STEPS 1 THRU 7 OK ?
NO
ALINE AUDIO TONE LEVEL (PARA 2-19). REPEAT GLIDESLOPE DDM PERFORMANCE TEST (PARA 2-12).
TEST OK ?
YES
NO
YES
STEPS 8 THRU 20 OK ?
NO
REPLACE ASSEMBLY A2 (PARA 2-35). AFTER REPLACING, ALINE (PARA 2-18).
YES
10 SH 10

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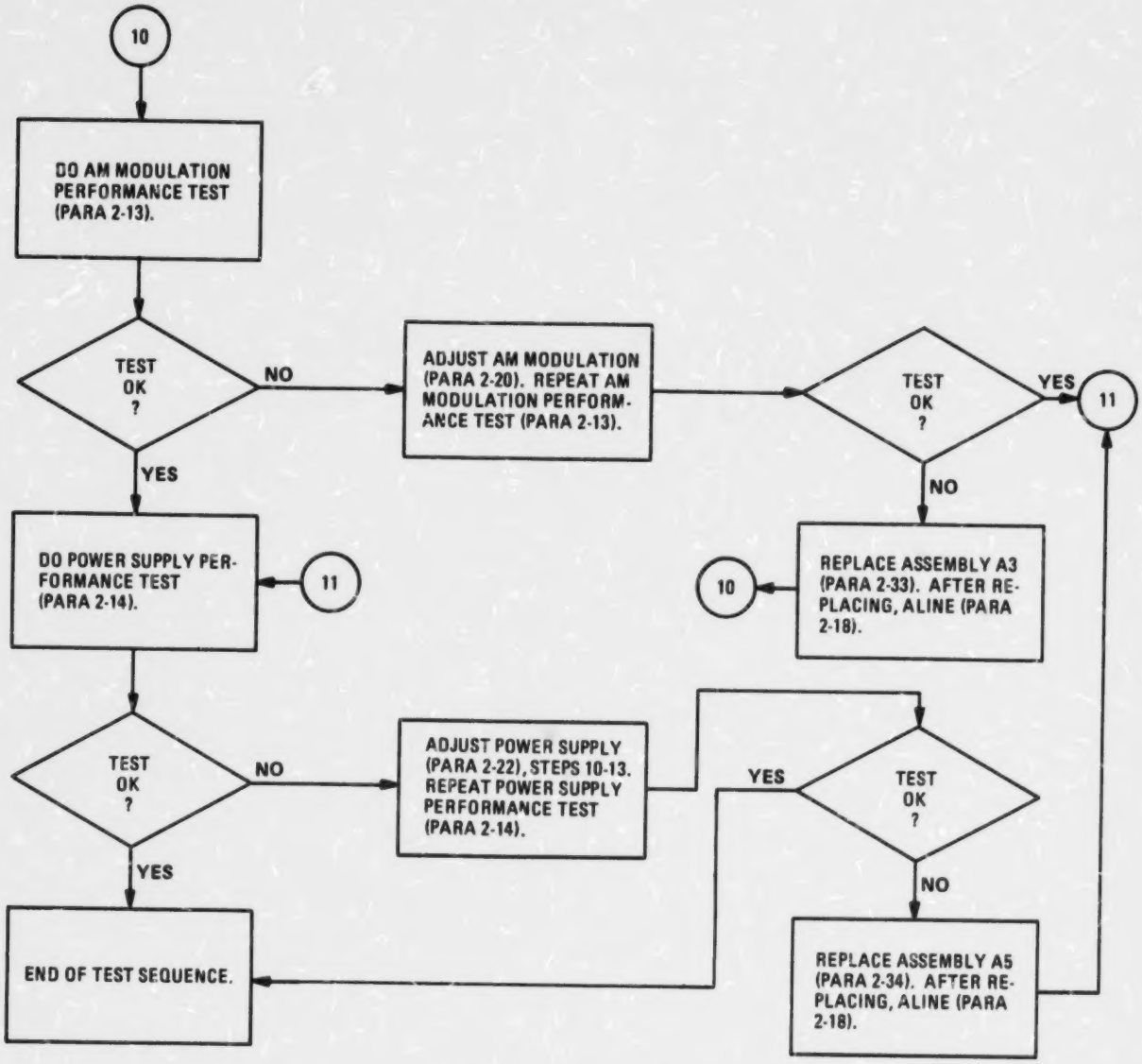
2-17. TROUBLESHOOTING CHARTS. (CONT)

CHART 2-1
Performance Test Failure Troubleshooting
(Sheet 10 of 11)



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2-17. TROUBLESHOOTING CHARTS. (CONT)

CHART 2-1
Performance Test Failure Troubleshooting
(Sheet 11 of 11)

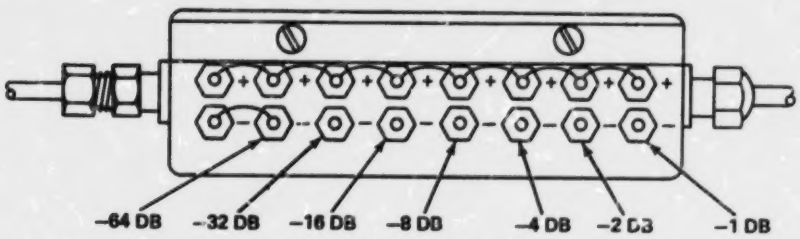

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TABLE A

TEST SET RF LEVEL (-dBmW) DISPLAY SETTING	TEST POINT LOGIC VOLTAGES						
	RF64	RF32	RF16	RF8	RF4	RF2	RF1
-7	HI	HI	HI	HI	HI	HI	LO
-8	HI	HI	HI	HI	HI	LO	HI
-10	HI	HI	HI	HI	LO	HI	HI
-14	HI	HI	HI	LO	HI	HI	HI
-20	HI	HI	HI	LO	LO	LO	HI
-48	HI	LO	HI	LO	HI	LO	HI
-91	LO	HI	LO	HI	LO	HI	LO

NOTE

If using voltmeter, HI voltage is between 10.0 and 14.0 vdc and LO voltage is 0.4 vdc or less.

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Section IV ALINEMENT AND ADJUSTMENT PROCEDURES

Subject	Para	Page
General	2-18	2-31
Audio Tone Level Alinement	2-19	2-32
AM Modulation Adjustment	2-20	2-34
Analog Card A2A2 + 12 VDC Regulator Adjustment	2-21	2-36
Power Supply Alinement	2-22	2-38
RF Output Frequency Alinement	2-23	2-40
RF Output Level Alinement	2-24	2-41
VOR Radial Adjustment	2-25	2-42
Audio Tone Frequency Alinement	2-26	2-44

2-18. GENERAL.

The following alinement/adjustment procedures should be performed only if you are instructed to do so by the troubleshooting procedures in section III, or as a followup to replacement of a test set assembly.

After test set assembly A2, A3, A4, or A5 is replaced, the alinement/adjustment procedures specified in the following table must be performed.

Dust cover must be removed before attempting any alinement and adjustment procedure (para 2-28).

ASSEMBLY REPLACED	ALINEMENT/ADJUSTMENT PROCEDURES
A2	Analog Card A2A2 + 12 VDC Adjustment (para 2-21), Audio Tone Frequency Alinement (para 2-26), Audio Tone Level Alinement (para 2-19), VOR Radial Adjustment (para 2-25).
A3	RF Output Level Alinement (para 2-24) AM Modulation Adjustment (para 2-20)
A4	RF Output Frequency Alinement (para 2-23)
A5	Power Supply Alinement (para 2-22)

Each alinement procedure is self-contained, that is, all necessary instructions are provided without reference to any previously preformed alinement. All necessary test equipment is also listed within each procedure.

WARNING

HIGH VOLTAGE is used during the following procedures. Death on contact may result if personnel fail to observe safety precautions. Dangerous potentials exist at several points throughout this equipment, when it is operated with the cover removed. Do not touch exposed connections or components.

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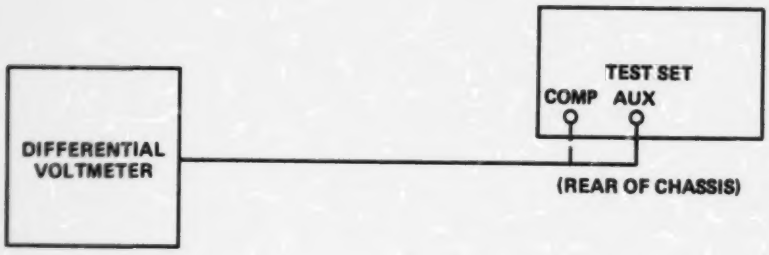
2-19. AUDIO TONE LEVEL ALINEMENT.

TEST EQUIPMENT REQUIRED: Differential Voltmeter, Fluke 887 AB/AN
RF Cable RG-58/U with BNC plug-to-double banana plug terminations

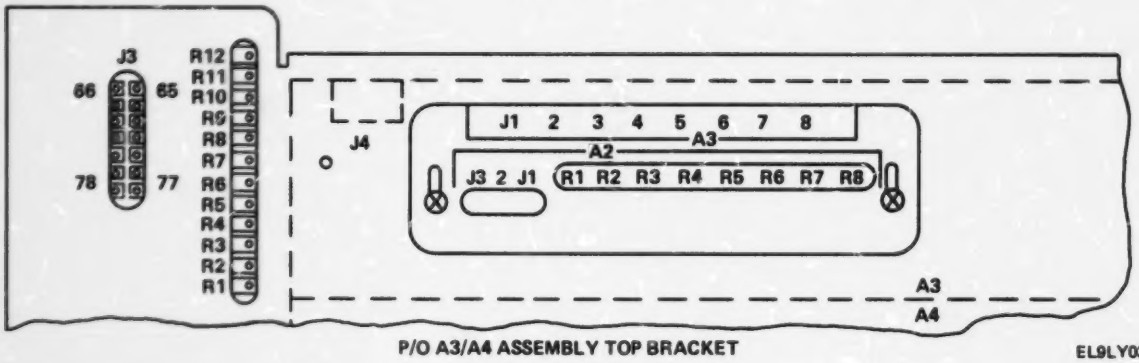
EQUIPMENT SETUP: Connect test set to 115 vac power source.
Connect differential voltmeter to test set as indicated in the following diagram.



EL9LY029

Turn equipment on. Allow at least 30 minutes for warmup.

PROCEDURE



P/O A3/A4 ASSEMBLY TOP BRACKET

EL9LY030

1. Enter VOR frequency 108.00 MHz into test set.
2. Locate A2A2 pots on left side of A3/A4 assemblies top bracket.
3. Adjust A2A2R12 until differential voltmeter indicates 1.000 ± 0.0002 v rms.
4. Disconnect differential voltmeter from test set AUX connector and connect to COMP connector.
5. Turn A2A2R9 fully clockwise.
6. Extinguish 9960 FM TONE SELECT key.

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2-19. AUDIO LEVEL ALINEMENT. (CONT)

NOTE

30 Hz VAR TONE/SELECT key remains lit.

7. Adjust A2A2R3 until differential voltmeter indicates 1.022 ± 0.002 v rms.
8. Turn A2A2R6 fully clockwise.
9. Extinguish 30 Hz VAR TONE SELECT key.
10. Press (to light) 9960 FM TONE SELECT key.
11. Adjust A2A2R2 for 1.040 ± 0.002 v rms.
12. Adjust A2A2R6 for 1.000 ± 0.001 v rms.
13. Extinguish 9960 FM TONE SELECT key.
14. Press (to light) 30 Hz VAR TONE SELECT key.
15. Adjust A2A2R9 for 1.000 ± 0.001 v rms.
16. Extinguish 30 Hz VAR TONE SELECT key.
17. Press (to light) 1020 Hz TONE SELECT key.
18. Adjust A2A2R10 for 1.000 ± 0.001 v rms.
19. Enter localizer frequency 108.10 MHz into test set.
20. Alternately light and extinguish 150 Hz and 90 Hz TONE SELECT keys, so that only one key is lit at one time. After each key (tone) change, adjust A2A2R7 until differential voltmeter indicates 150 Hz voltage is within 50 μv rms of 90-Hz voltage.
21. Select 150 Hz TONE SELECT key only.
22. Adjust A2A2R4 for 1.000 ± 0.001 v rms. Record exact voltage.
23. Extinguish 150 Hz TONE SELECT key.
24. Press (to light) 90 Hz TONE SELECT key. If differential voltmeter does not indicate 1.000 ± 0.001 v rms and is not within 50 μv rms of voltage recorded in step 22, repeat steps 20 through 24.
25. Extinguish 90 Hz TONE SELECT key.
26. Press (to light) 1020 Hz TONE SELECT key.
27. Adjust A2A2R5 until differential voltmeter indicates 1.5000 ± 0.0015 v rms.
28. Turn off test set and remove differential voltmeter.

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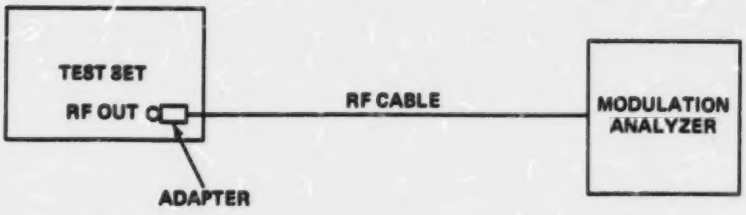
2-20. AM MODULATION ADJUSTMENT.

TEST EQUIPMENT REQUIRED: Adapter, N plug-to-BNC jack
Modulation Analyzer HP 8901
RF Cable RG-58/U

EQUIPMENT SETUP: Connect test set to 115 vac power source.
Connect modulation analyzer to test set as indicated in the following diagram.



EL9LY021

Turn on equipment. Allow at least 30 minutes for warmup.

PROCEDURE

1. Enter frequency 110.10 MHz into test set.
2. Extinguish 150 Hz TONE SELECT key.

NOTE

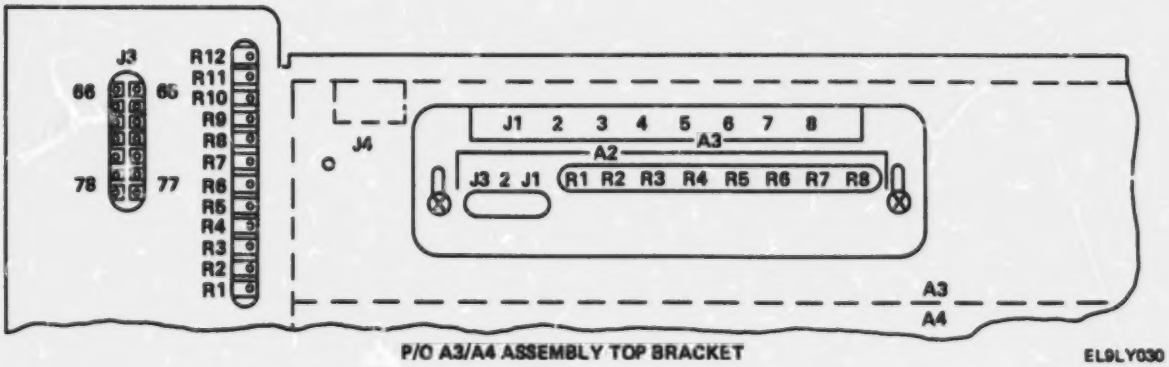
90 Hz TONE SELECT key remains lit.

3. Press (to light) % MOD FUNCTION/CONTROL key.

NOTE

RDL/DDM/MOD key indicates 20.0 MOD (%).

4. Reduce RF LEVEL to -6 dBmW.



P/O A3/A4 ASSEMBLY TOP BRACKET

EL9LY030

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2-20. AM MODULATION ADJUSTMENT. (CONT)

5. Locate A3A2 puts on right side of A3/A4 assemblies top bracket.
6. Adjust A3A2R2 until modulation analyzer indicates 20.0 ± 0.5% AM.
7. Enter frequency 113.00 MHz into test set.
8. Extinguish 9960 FM TONE SELECT key.

NOTE

30 Hz VAR TONE SELECT key remains lit.

9. Press (to light) % MOD FUNCTION/CONTROL key.

NOTE

RDL/DDM/MOD display indicates 30.0 MOD (%).

10. Adjust A3A2R4 until modulation analyzer indicates 30.0 ± 0.75% AM. Record exact value.
11. Extinguish 30 Hz VAR TONE SELECT key.
12. Press (to light) 9960 Hz TONE SELECT key. Record exact modulation analyzer indication.
13. Add value recorded in step 12 to value recorded in step 10. Divide the sum by 2.
14. Adjust A3A2R4 until average calculated in step 13 is 30.0 ± 0.75 percent.
15. Enter frequency 332.00 MHz into test set.
16. Extinguish 150 Hz TONE SELECT key.

NOTE

90 Hz TONE SELECT key remains lit.

17. Press (to light) % MOD FUNCTION/CONTROL key.

NOTE

RDL/DDM/MOD display indicates 40.0 MOD (%).

18. Adjust A3A2R3 until modulation analyzer indicates 40.0 ± 1.0% AM.
19. Enter frequency 75.00 MHz into test set.
20. Select 1300 Hz TONE SELECT key.
21. Press (to light) % MOD FUNCTION/CONTROL key.

NOTE

RDL/DDM/MOD display indicates 95.0 MOD (%).

22. Adjust A3A2R1 until modulation analyzer indicates 95 ± 2.37 AM.

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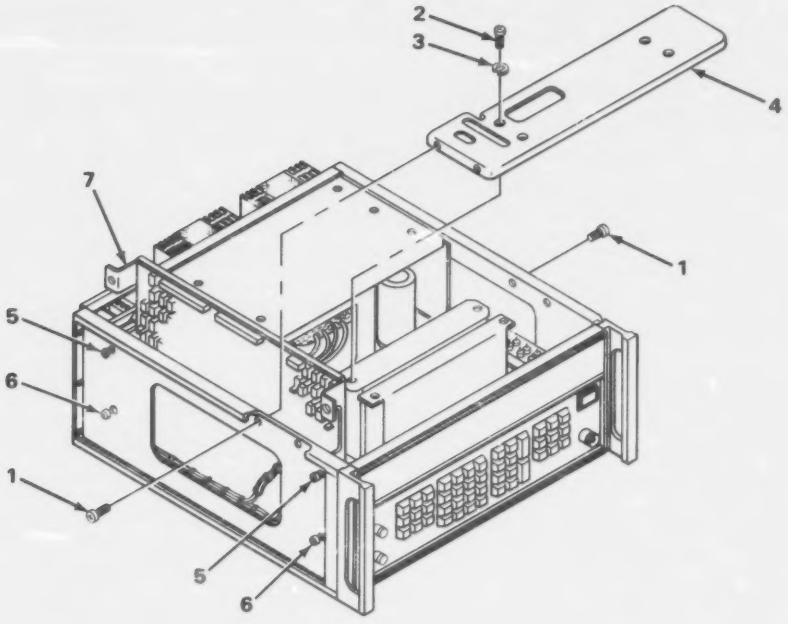
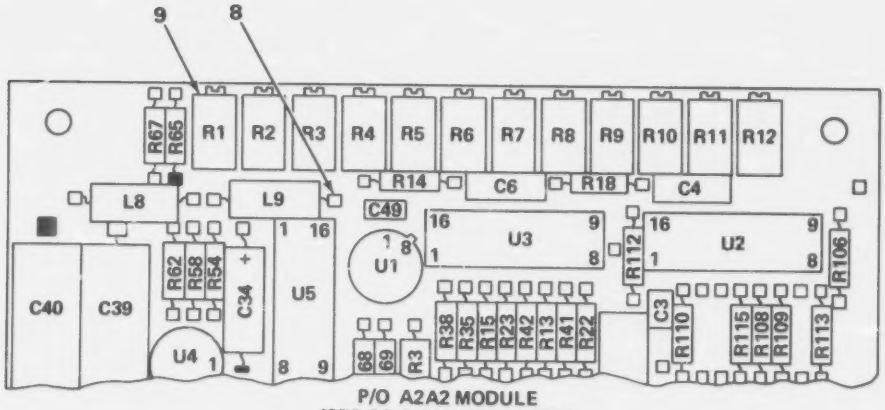
50.

2-21. ANALOG CARD A2A2 + 12 VDC REGULATOR ADJUSTMENT.

TEST EQUIPMENT REQUIRED: Digital Voltmeter HP 3490A

EQUIPMENT SETUP: Do steps 1 through 6.





P/O A2A2 MODULE
(SEE FO-5 FOR FULL VIEW)

EL9LY087

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51.

2-21. ANALOG CARD A2A2 + 12 VDC REGULATOR ADJUSTMENT. (CONT)

1. Remove four screws (1) from sides of chassis and four screws (2) and lockwashers (3) from top bracket (4).
2. Remove top bracket (4).
3. Loosen two top turn-lock fasteners (5) and two bottom turn-lock fasteners (6).
4. Raise assembly A2 (7) to aline bottom holes with two top turn-lock fasteners (5).
5. Tighten two top turn-lock fasteners (5).
6. Connect digital voltmeter to L9 at pad connection (8).

Turn on test equipment. Allow at least 30 minutes for warmup.

PROCEDURE

7. Adjust A2A2R1 (9) until digital voltmeter indicates 12.00 ± 0.02 vdc.
8. Loosen two top turn-lock fasteners (5) and lower assembly A2 (7) to aline bottom holes with two bottom turn-lock fasteners (6).
9. Tighten two bottom turn-lock fasteners (6) and two top turn-lock fasteners (5).
10. Position top bracket (4) in chassis and install four screws (1) through sides of chassis.
11. Install four screws (2) and lockwashers (3) through top bracket (4).

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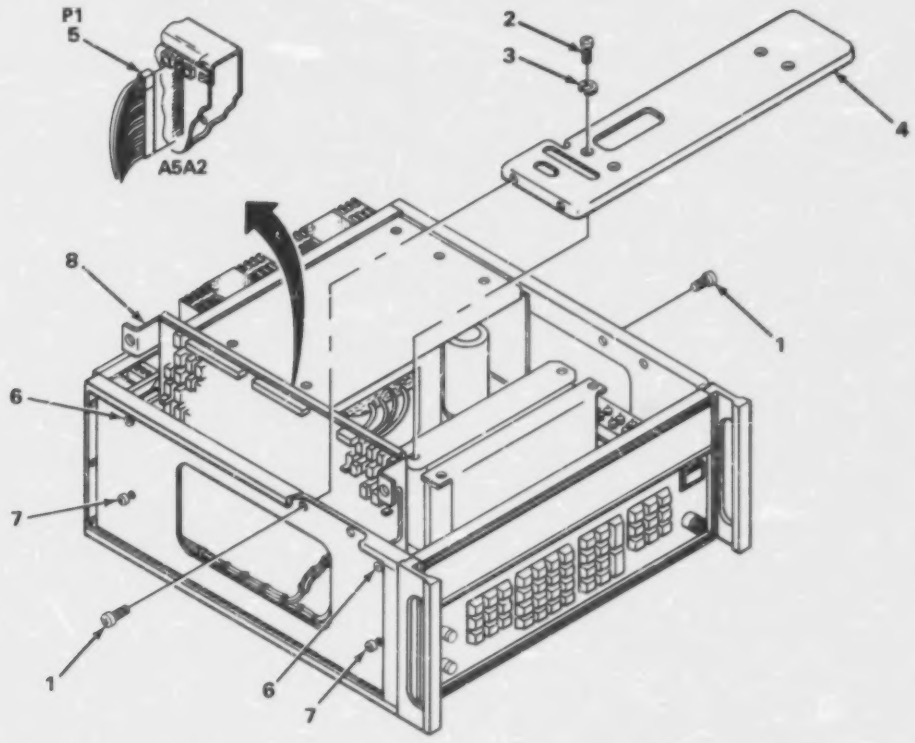
2-22. POWER SUPPLY ALINEMENT.

TEST EQUIPMENT REQUIRED: Digital Voltmeter HP 3490A
Resistor, 100-ohm, ± 1.0%, 1/8-watt

EQUIPMENT SETUP: Turn off test set and remove power cable.



EL9LY031

1. Remove four screws (1) from sides of chassis and four screws (2) and lockwashers (3) from top bracket (4).
2. Remove top bracket (4).
3. Unplug connector P1 (5) from A5A2 assembly.
4. Loosen two top turn-lock fasteners (6) and two bottom turn-lock fasteners (7).
5. Raise assembly A2 (8) to aline bottom holes with two top turn-lock fasteners (6).
6. Tighten two top turn-lock fasteners (6).

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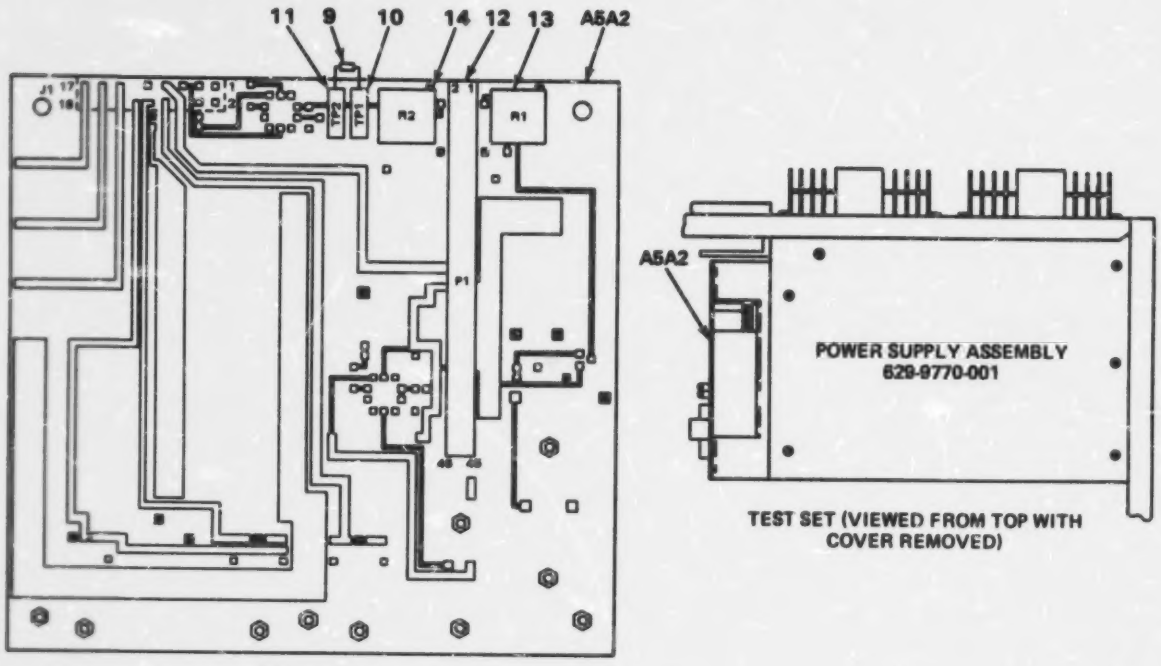
2-22. POWER SUPPLY ALINEMENT. (CONT)



7. Connect 100-ohm resistor (9) between A5A2TP1 (10) and TP2 (11).
8. Connect digital voltmeter to A5A2P1 pin 29 (12).
9. Turn A5A2R1 (13) and A5A2R2 (14) fully counterclockwise.

Turn equipment on. Allow at least 30 minutes for warmup.

PROCEDURE

10. Adjust A5A2R2 (14) until digital voltmeter indicates 6.4 ± 0.1 vdc.
11. Slowly adjust A5A2R1 (13) until digital voltmeter drops to less than 1.5 vdc.
12. Turn test set power off.
13. Remove 100-ohm resistor (9) from TP1 (10) and TP2 (11).
14. Turn test set power on.
15. Adjust A5A2R2 (14) until digital voltmeter indicates 5.00 ± 0.05 vdc.
16. Turn test set power off.
17. Disconnect digital voltmeter from test set.
18. Reconnect wiring harness connector P1 to matching A5A2 module pins. (See illustration, page 2-39.)
19. Connect digital voltmeter to connector pin A2A3J1-8 on assembly A2 (FO-6).
20. Turn test set power on.
21. Adjust A5A2R2 (14) until voltmeter indicates 5.00 ± 0.5 vdc.
22. Turn test set off and disconnect meter from A2A3J-8.

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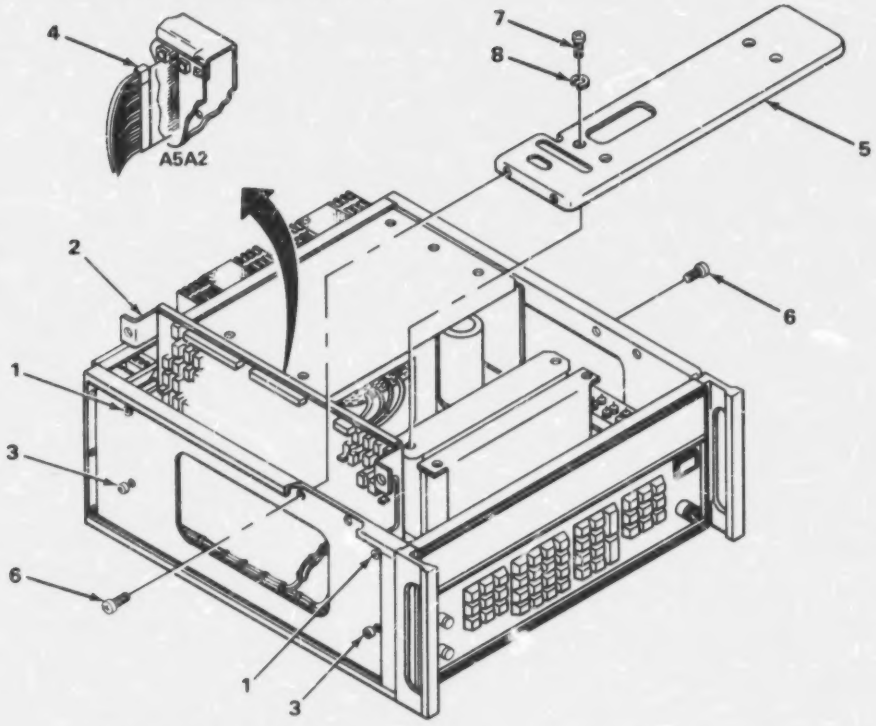
2-22. POWER SUPPLY ALINEMENT. (CONT)



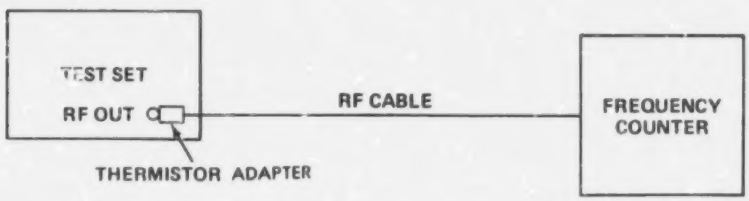
EL9LY066

23. Loosen two top turn-lock fasteners (1) and lower assembly A2 (2) to aline bottom holes of assembly A2 with two bottom turn-lock fasteners (3).
24. Tighten two bottom turn-lock fasteners (3) and two top turn-lock fasteners (1).
25. Plug connector P1 (4) into A5A2 assembly.
26. Position top bracket (5) in chassis and install four screws (6) through sides of chassis.
27. Install four screws (7) and lockwashers (8) through top bracket (5).

2-23. RF OUTPUT FREQUENCY ALINEMENT.

TEST EQUIPMENT REQUIRED: Adapter, N plug-to-BNC jack
Frequency Counter HP 5345A
RF Cable RG-58/U

EQUIPMENT SETUP: Connect test set to 115 vac power source.
Connect frequency counter to test set as indicated in the following diagram.



EL9LY011

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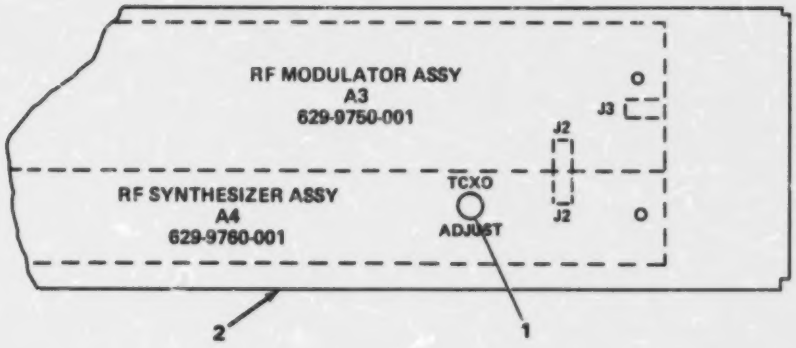
2-23. RF OUTPUT FREQUENCY ALINEMENT. (CONT)

Turn equipment on. Allow at least 30 minutes for warmup.

PROCEDURE

1. Enter frequency 108.00 MHz into test set.
2. Remove all modulation by extinguishing all lit TONE SELECT keys.
3. Set test set RF LEVEL at -6 dBmW.



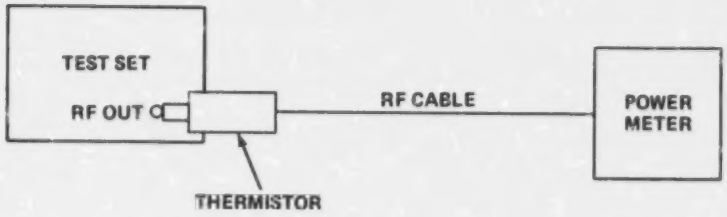
EL9LY024

4. Adjust TCXO ADJUST (1), located on A3/A4 assemblies top bracket (2), until frequency counter indicates 108.000 MHz ± 54 Hz.

2-24. RF OUTPUT LEVEL ALINEMENT.

TEST EQUIPMENT REQUIRED: Power Meter HP 435A with thermistor mount 478A
RF Cable RG-58/U

EQUIPMENT SETUP: Connect test set to 115 vac power source.
Connect power meter/sensor to test set as indicated in the following diagram.



EL9LY013

Turn equipment on. Allow at least 30 minutes for warmup.

PROCEDURE

1. Enter frequency 75.00 MHz into test set.
2. Set test set RF LEVEL to -6 dBmW.
3. Remove modulation by extinguishing all TONE SELECT keys.

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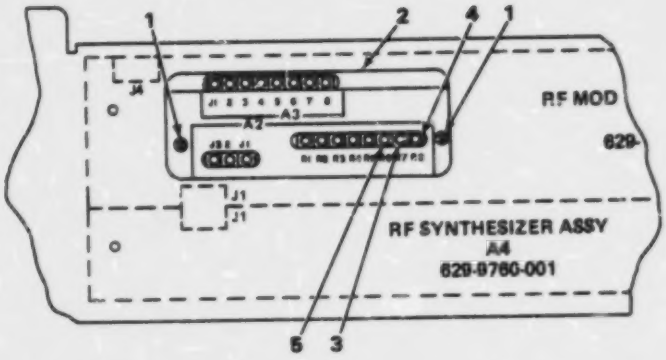
2-24. RF OUTPUT LEVEL ALINEMENT. (CONT)

PROCEDURE (CONT)



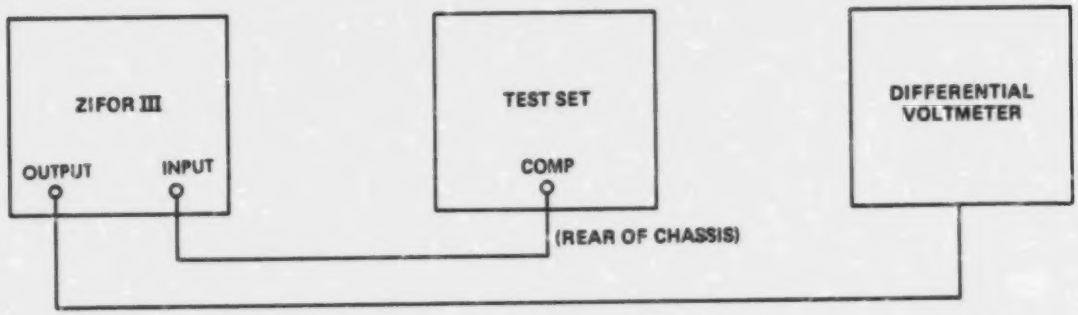
EL9LY025

4. Loosen two screws (1) that secure test point cover (2) and slide cover to expose test points.
5. Adjust A3A2R7 (3) until power meter indicates -6.0 ± 0.1 dBmW.
6. Enter frequency 108.00 MHz and RF LEVEL of -6dBmW into test set.
7. Press to extinguish 30 Hz VAR and 9960 FM TONE keys.
8. Adjust A3A2R8 until power meter indicates -6.0 ± 0.1 dBmW.
9. Enter frequency 332.00 MHz into test set and set RF LEVEL to -6dBmW.
10. Push to extinguish 90 Hz and 150 Hz TONE keys.
11. Adjust A3A2R6 (1) until power meter indicates -6.0 ± 0.1 dBmW.
12. Press RF ON/OFF switch to turn off rf.
13. Disconnect thermistor from test set.

2-25. VOR RADIAL ADJUSTMENT.

TEST EQUIPMENT REQUIRED: Differential Voltmeter, Fluke 887AB/AN
Zifor III
Phasemeter, Dranetz 305C/305-PA-3001

EQUIPMENT SETUP: Connect test set to 115 vac power source.
Connect equipment as shown in the following diagram.



EL9LY084

Set zifor III to zero mode.
Turn equipment on. Allow at least 30 minutes for warmup.

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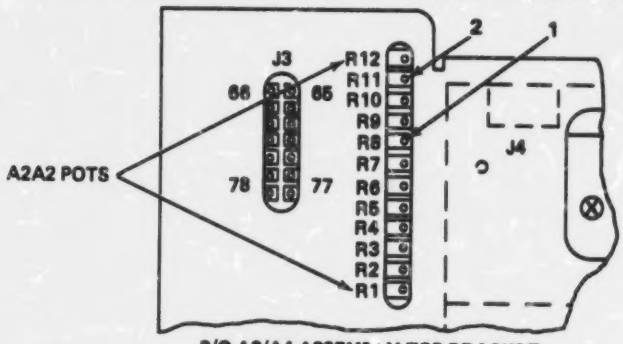
2-25. VOR RADIAL ADJUSTMENT. (CONT)

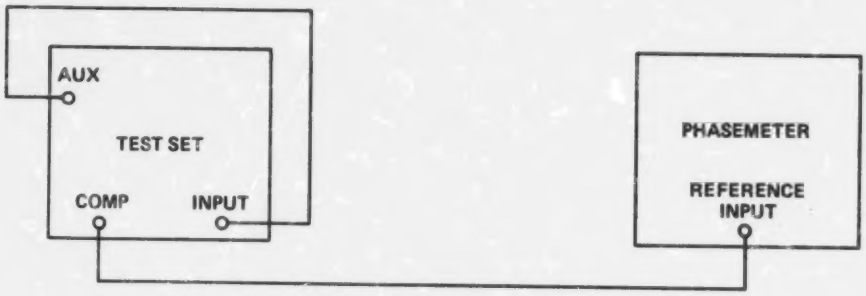
PROCEDURE

1. Set test set to standard VOR signal at 116.000 MHz.
2. Adjust zifor III balance control for a minimum reading (null) on the differential voltmeter.



EL9LY083

3. Fine tune both the zifor III amplitude balance control and A2A2R8 (1) to obtain a null on the differential voltmeter.
4. Set the test set to 359.98 degree radial.
5. Check that null voltage increases from step 3.
6. Set the test set to 0.02 degree radial.
7. Check that null voltage increases from step 3.
8. Disconnect input to COMP connector on rear panel of test set and connect it to DEMOD.
9. Obtain null on differential voltmeter by stepping test set radial in + or -0.01 degree increments and adjusting zifor III amplitude balance control for a null at each step. Determine step where best null occurs. Best null will occur near 0 degrees.
10. Check that the test set RDL/DDM/MOD radial indication is 0.00 ± 0.05 degrees with best null obtained in step 9.
11. Disconnect zifor III from test set.
12. Turn off all equipment.
13. Connect equipment as shown in the following diagram.



EL9LY085

14. Turn on all equipment. Allow at least 5 minutes for warmup.
15. Set test set to 30 Hz VAR tone only at a 0 degree radial.
16. Adjust A2A2R11 (2) for 0.00 ± 0.10 degree phase difference.
17. Set test set to 180 degree radial.
18. Check that phase difference is 179.80 to 180.20 degrees.
19. Turn test set off and disconnect phasemeter.

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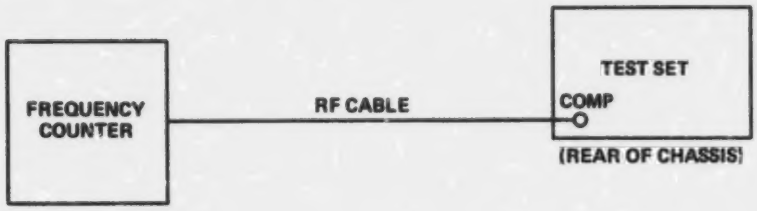
58.

2-26. AUDIO TONE FREQUENCY ALINEMENT.

TEST EQUIPMENT REQUIRED: Frequency Connector HP 5345A
RF Cable RG-58/U

EQUIPMENT SETUP: Connect test equipment to 115 vac power source.
Connect frequency counter to test set as indicated in the following diagram.

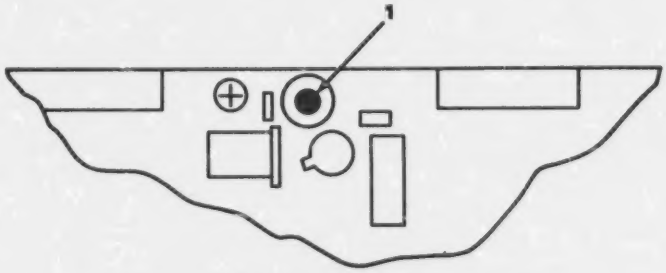


EL9LY027

Turn equipment on. Allow at least 30 minutes for warmup.

PROCEDURE

1. Enter frequency 108.00 MHz into test set.
2. Extinguish 30 Hz VAR and 9960 FM TONE SELECT keys.
3. Press (to light) 9960 Hz TONE SELECT key.



P/O TDM BOARD A2A3
(SEE FO-6 FOR FULL VIEW)

EL9LY028

4. Adjust A2A3C7 (1) until frequency counter indicates 100.4016 ± 0.0010 μs (9960.0000 ± 0.0991 Hz).

NOTE

Since all the audio tones are generated by the same crystal, it is not necessary to aline more than one tone.

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Section V GENERAL SUPPORT MAINTENANCE PROCEDURES

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2-27. GENERAL.

This section provides instructions for general support maintenance of Test Set, Receiver AN/ARM-180. The following initial setup applies to all maintenance procedures.

Resources required are not listed unless they apply to the particular procedure.

Personnel are listed only if the task requires more than one technician. If Personnel Required is not listed, one technician can do the task.

The normal equipment condition to start a maintenance procedure is power off and power supply cable disconnected from the test set.

Tool Kit, Calibration and Repair is used for all maintenance procedures, and is not listed. Any special tools, or tools not authorized with this tool kit, will be listed for each maintenance procedure as needed.

Tag, or otherwise identify, all disconnected wires and/or cables. Note color coding, placement, and methods of insulation (if used) on all wires, cables, and/or components before unsoldering or removing.

Always pull printed circuit board connectors straight out until connector clears mating pins on printed circuit boards.

All soldering will be in accordance with TB SIG-222.

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2-27. GENERAL. (CONT)

The controller/audio assembly A2 and the rf modulator assembly A3 contain MOS devices that can be damaged by static voltage. Although most MOS devices contain internal gate protection circuits, good practice dictates careful handling of assemblies containing MOS devices and the following precautions should be observed.

1. Deenergize or disconnect all power, signal sources, and loads used with the signal generator.
2. Place the signal generator on grounded conductive work surface.
3. The repair technician must be grounded through a conductive wrist strap or other device using a 1 MΩ series resistance to protect the operator. No two objects, including fingers, workbench, test equipment, and tools shall simultaneously contact an MOS assembly unless, the objects have first been placed in electrical contact with one another. The electrical contact shall have a path resistance of 1 MΩ or less, and shall have to be maintained for at least several seconds.
4. Ground any tools, including soldering equipment, that might come in contact with MOS assemblies.
5. When MOS assemblies are removed from the signal generator, they should be placed on the conductive work surface, or in conductive containers. When an MOS assembly is inserted in or removed from a container, the repair technician should maintain contact with the conductive portion of the container.
6. When not working on MOS assemblies, wrap disconnected circuit boards in aluminum foil or in plastic bags that have been coated or impregnated with conductive material.
7. Do not handle MOS assemblies unnecessarily or remove them from their packages until being used or tested.

CAUTION

Failure to observe all of the MOS assembly precautions can cause permanent damage to the MOS device. This damage can cause the device to fail immediately, or at a later date when exposed to an adverse environment.

NOTE

The acronym MOS for Metal-Oxide-Semiconductor. A MOS structure is a conductor and a semi-conductor substrate separated by a thin dielectric.

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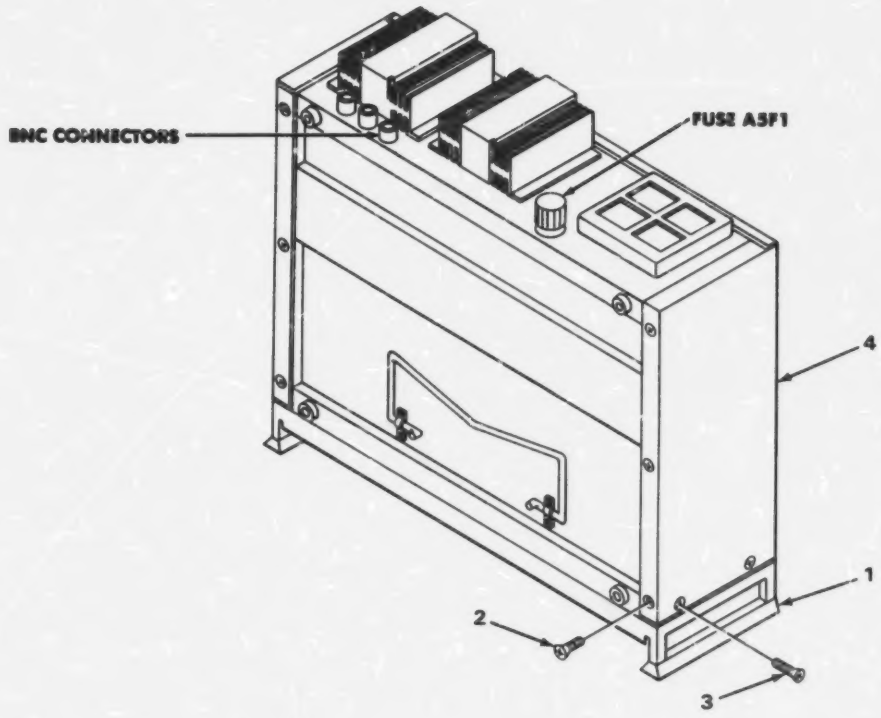
2-28. DUST COVER REPLACEMENT.

MATERIALS/PARTS: Cover, dust (PN 629-9747-001)



EL9LY035

REMOVAL

1. Stand test set face down on handles (1).
2. Remove six screws (2) from bottom of test set.
3. Remove four screws (3), two from each side of test set.
4. Slide dust cover (4) off chassis.

INSTALLATION

NOTE

Position dust cover with holes on sides toward handles.

1. Slide dust cover (4) onto chassis.
2. Install four screws (3), two into each side of test set.
3. Install six screws (2) into bottom of test set.

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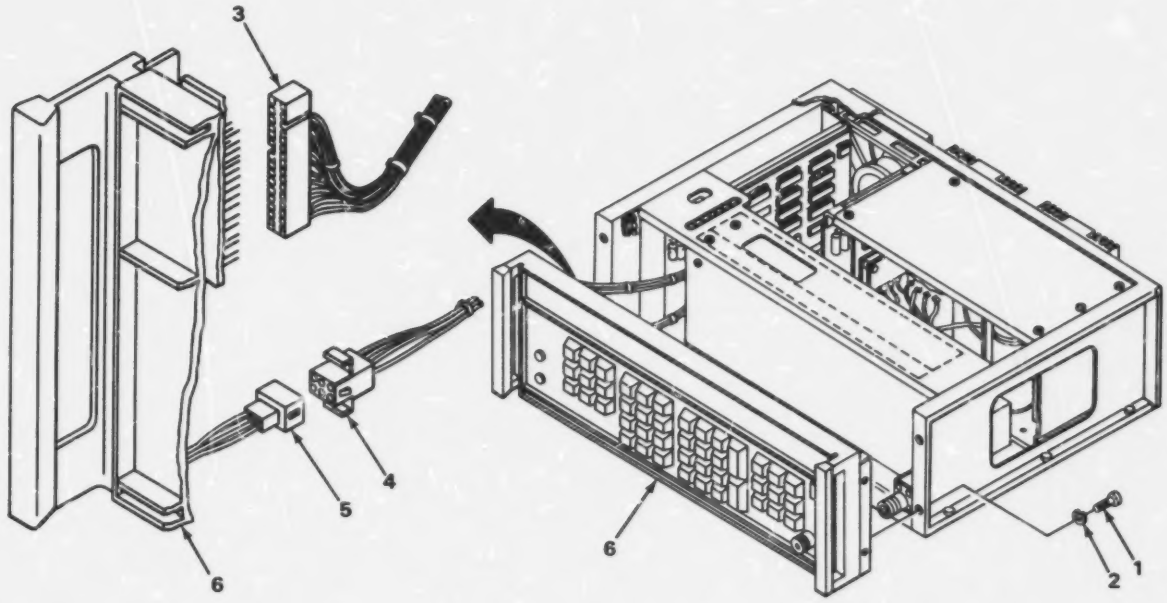
2-29. FRONT PANEL ASSEMBLY A1 REPLACEMENT.

MATERIALS/PARTS: Assembly, front panel, A1 (PN 629-9730-001)
PRELIMINARY PROCEDURE: Remove dust cover (para 2-28).



EL9LY036

REMOVAL

1. Remove four screws (1) and lockwashers (2).
2. Unplug connector P6 (3) from printed circuit board and connector J4 (4) from connector A1P1 (5).
3. Remove front panel assembly (6).

INSTALLATION

1. Plug connector A1P1 (5) into connector J4 (4) and connector P6 (3) to printed circuit board.
2. Position front panel (6) on chassis.
3. Install four screws (1) and lockwashers (2).

FOLLOW-ON MAINTENANCE: Install dust cover (para 2-28).

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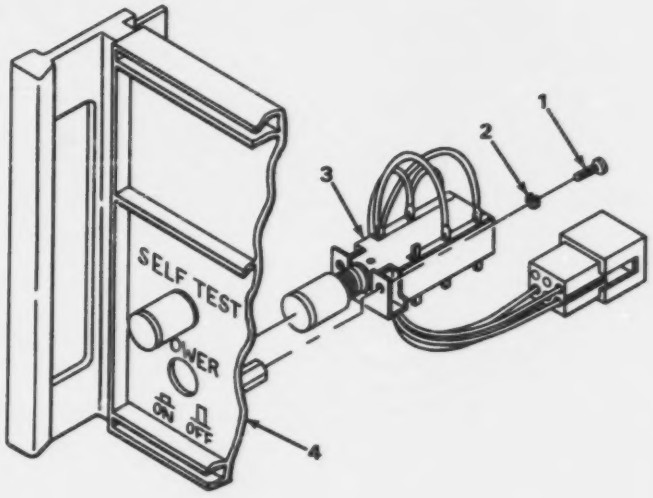
2-30. POWER SWITCH S54 REPLACEMENT.

MATERIALS/PARTS: Switch, POWER, S54 (PN NE15F01-0003-00)
PRELIMINARY PROCEDURE: Remove front panel assembly A1 (para 2-29).



EL9LY037

REMOVAL

Remove two screws (1) and lockwashers (2) and remove switch (3) from front panel (4).

INSTALLATION

Position switch (3) in front panel (4) and install two screws (1) and lockwashers (2).

FOLLOW-ON MAINTENANCE: Install front panel assembly A1 (para 2-29).

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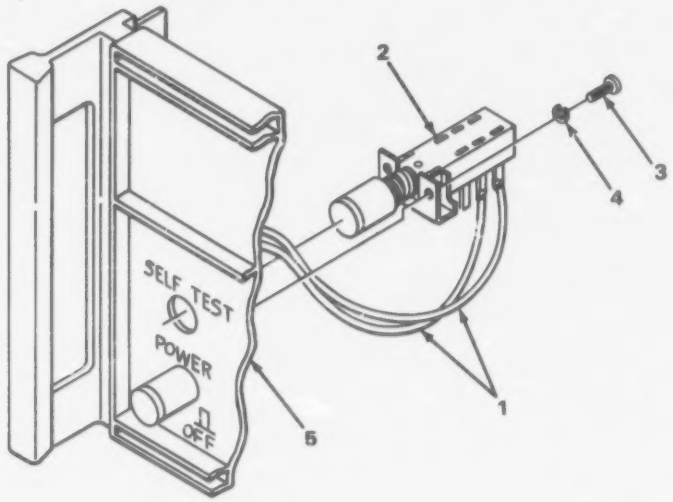
2-31. SELF TEST SWITCH S53 REPLACEMENT.

MATERIALS/PARTS: Switch, SELF TEST, S53 (PN 266-7508-090)
PRELIMINARY PROCEDURE: Remove front panel assembly A1 (para 2-29).



EL9LY038

REMOVAL

1. Tag and unsolder two wires (1) from switch (2).
2. Remove two screws (3) and lockwashers (4) and remove switch (2) from front panel (5).

INSTALLATION

1. Position switch (2) in front panel (5).
2. Install two screws (3) and lockwashers (4).
3. Solder two wires (1) to switch (2).
4. Remove tags.

FOLLOW-ON MAINTENANCE: Install front panel assembly A1 (para 2-29).

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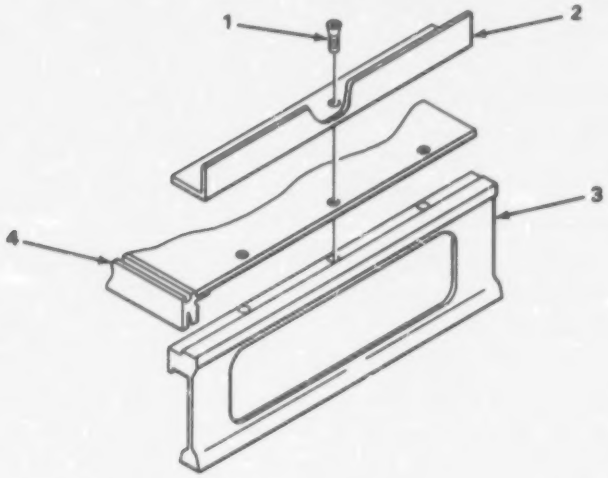
2-32. FRONT PANEL HANDLE REPLACEMENT.

MATERIALS/PARTS: Handles (PN 632-5203-001)
PRELIMINARY PROCEDURE: Remove front panel assembly A1 (para 2-29).



EL9LY039

REMOVAL

NOTE

Steps given are typical for both handles.

Remove screw (1), bracket (2), and handle (3) from front panel (4).

INSTALLATION

1. Install handle (3), bracket (2), and screw (1) to front panel (4). Do not tighten screw.

NOTE

Position bracket to aline all holes in bracket (2), front panel (4), and handle (3).

2. Tighten screw (1).

FOLLOW-ON MAINTENANCE: Install front panel assembly A1 (para 2-29).

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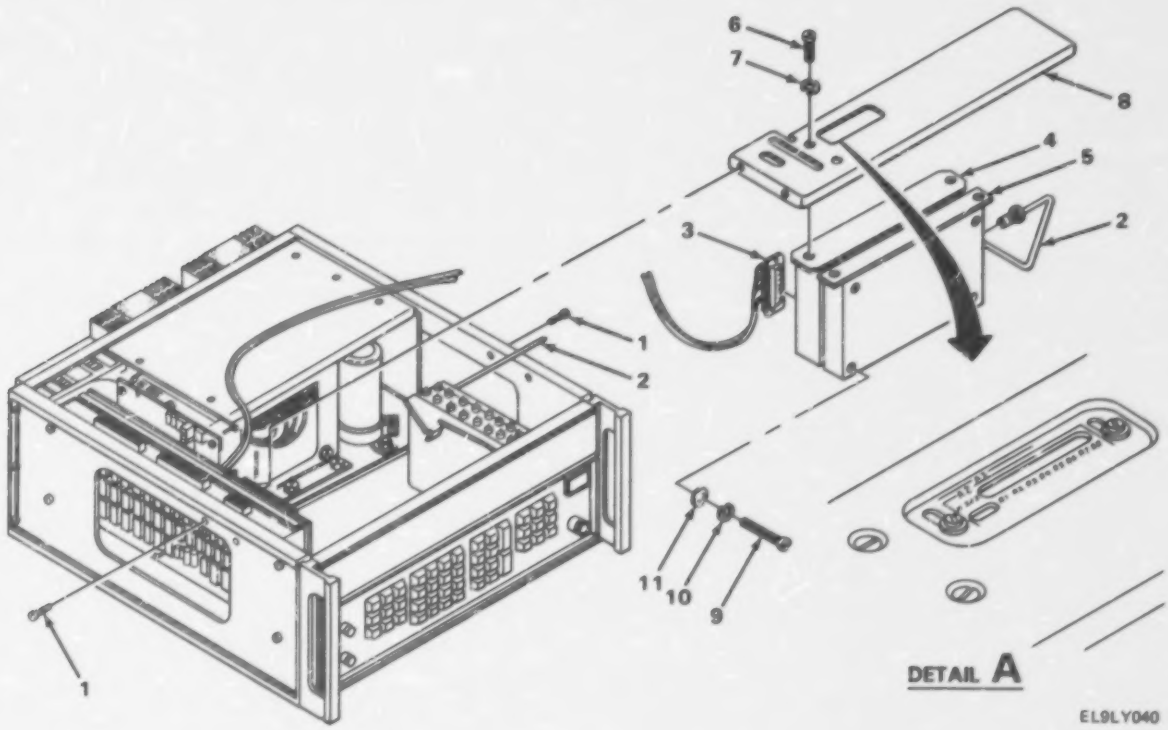
2-33. RF MODULATOR ASSEMBLY A3 AND SYNTHESIZER ASSEMBLY A4 REPLACEMENT.

MATERIALS/PARTS: Modulator, rf, assembly A3 (PN 629-9750-001)
Synthesizer assembly A4 (PN 629-9760-001)
PRELIMINARY PROCEDURE: Remove dust cover (para 2-28).



REMOVAL

1. Remove two screws (1) from each side of chassis.
2. Unplug coaxial connector (2) and connector P5 (3) from assembly A3 (4).
3. Lift assemblies A3 (4) and A4 (5) from chassis as a unit.

NOTE

If assemblies A3 (4) and A4 (5) are to be separated, perform steps 4 and 5.

4. Remove four screws (6) and lockwashers (7) and remove top bracket (8).
5. Remove four screws (9), lockwashers (10), and flat washers (11) and pull assemblies A3 (4) and A4 (5) apart.

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2-33. RF MODULATOR ASSEMBLY A3 AND SYNTHESIZER ASSEMBLY A4 REPLACEMENT. (CONT)

INSTALLATION

NOTE

If assemblies A3 (4) and A4 (5) are separated, perform steps 1, 2, and 3.

1. Aline coaxial connectors and plug connectors on assemblies A3 (4) and A4 (5) and push together.
2. Install four screws (9), lockwashers (10), and flat washers (11).
3. Position top bracket (8) on assemblies (detail A) and install four screws (6) and lockwashers (7).

NOTE

When placing assemblies A3 (4) and A4 (5) in chassis as a unit, aline pins on bottom of assembly A3 with holes in chassis.

4. Install assemblies A3 (4) and A4 (5) in chassis.
5. Connect coaxial connector (2) and connector P5 (3) to assembly A3 (4).
6. Install two screws (1) from each side of chassis.

FOLLOW-ON MAINTENANCE: Install dust cover (para 2-28).

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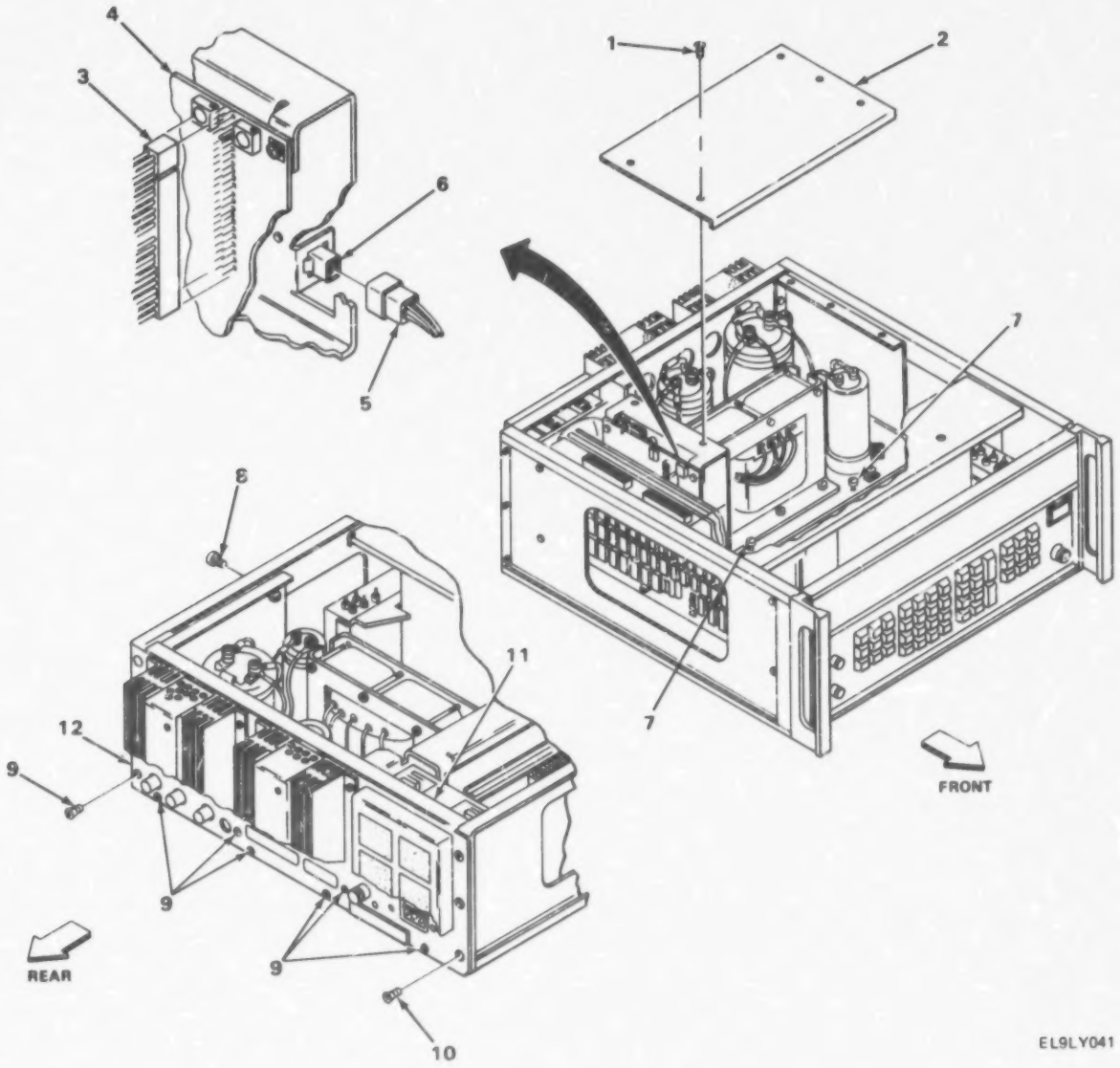
2-34. POWER SUPPLY ASSEMBLY A5 REPLACEMENT.

MATERIALS/PARTS: Power supply assembly A5 (PN 629-9770-001)
PRELIMINARY PROCEDURE: Remove dust cover (para 2-28).



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2-34. POWER SUPPLY ASSEMBLY A5 REPLACEMENT. (CONT)

REMOVAL

WARNING

Capacitors within the power supply could hold a substantial residual electrical charge. Before performing any maintenance task, deplete any residual charge. Injury or damage to equipment could result.

1. Remove six screws (1) and power supply cover (2).
2. Unplug connector P1 (3) from circuit board (4) and connector P2 (5) from connector J1 (6).
3. Loosen two turn-lock fasteners (7).
4. Remove one screw (8), seven screws (9), and six screws (10).

CAUTION

Extreme care must be taken when performing next step to prevent damaging BNC connectors on rear of chassis.

5. Lift front end of assembly A5 (11) 3 to 4 inches to allow back plate (12) to clear three BNC connectors (13) and remove assembly A5.

INSTALLATION

CAUTION

Extreme care must be taken when performing next step to prevent damaging BNC connectors on rear of chassis.

1. Raise front end of assembly A5 (11) 3 to 4 inches to allow back plate (12) to clear three BNC connectors (13) and lower assembly A5 into position.
2. Install six screws (10), seven screws (9), and one screw (8).
3. Tighten two turn-lock fasteners (7).
4. Plug connector P2 (5) into connector J1 (6) and connector P1 (3) into circuit board (4).
5. Position power supply cover (2) on assembly A5 (11) and install six screws (1).

FOLLOW-ON MAINTENANCE: Install dust cover (para 2-28).

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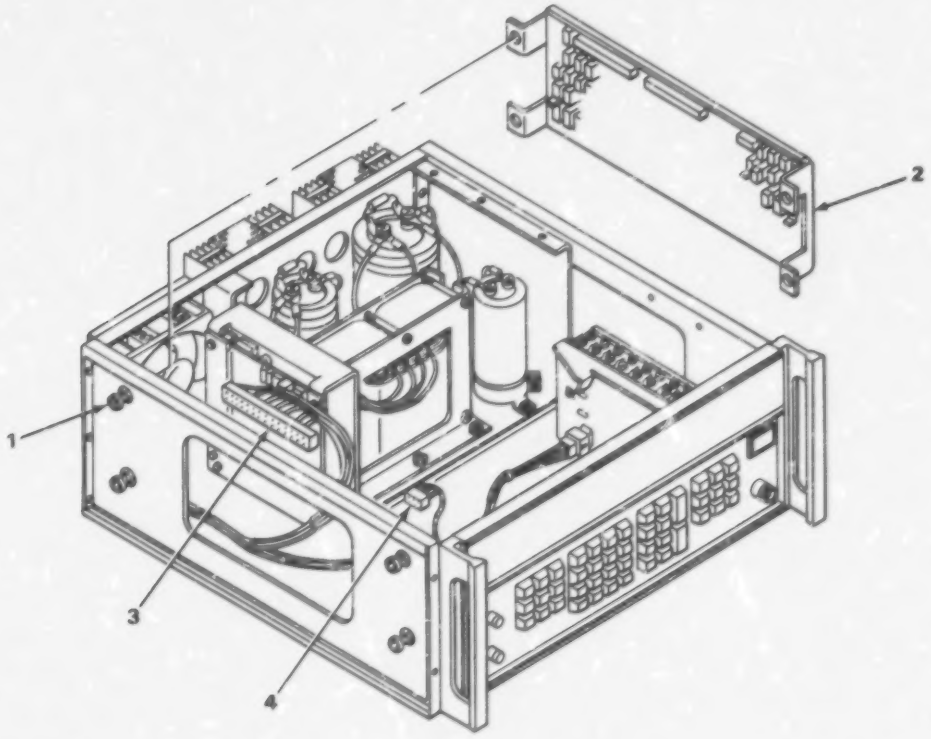
2-35. CONTROLLER/AUDIO ASSEMBLY A2 REPLACEMENT.

MATERIALS/PARTS: Controller/audio assembly A2 (PN 629-9740-001)
PRELIMINARY PROCEDURE: Remove rf modulator assembly A3 and synthesizer assembly A4 (para 2-33).



EL9LY042

REMOVAL

1. Loosen four turn-lock fasteners (1) and carefully lift assembly A2 (2) from chassis.
2. Unplug connector P1 (3) on A2A1 board and connector P2 (4) on A2A2 board.

INSTALLATION

1. Plug connector P1 (3) to A2A1 board and connector P2 (4) to A2A2 board.
2. Carefully lower assembly A2 (2) into chassis.
3. Tighten four turn-lock fasteners (1).

FOLLOW-ON MAINTENANCE: Install rf modulator assembly A3 and synthesizer assembly A4 (para 2-33).

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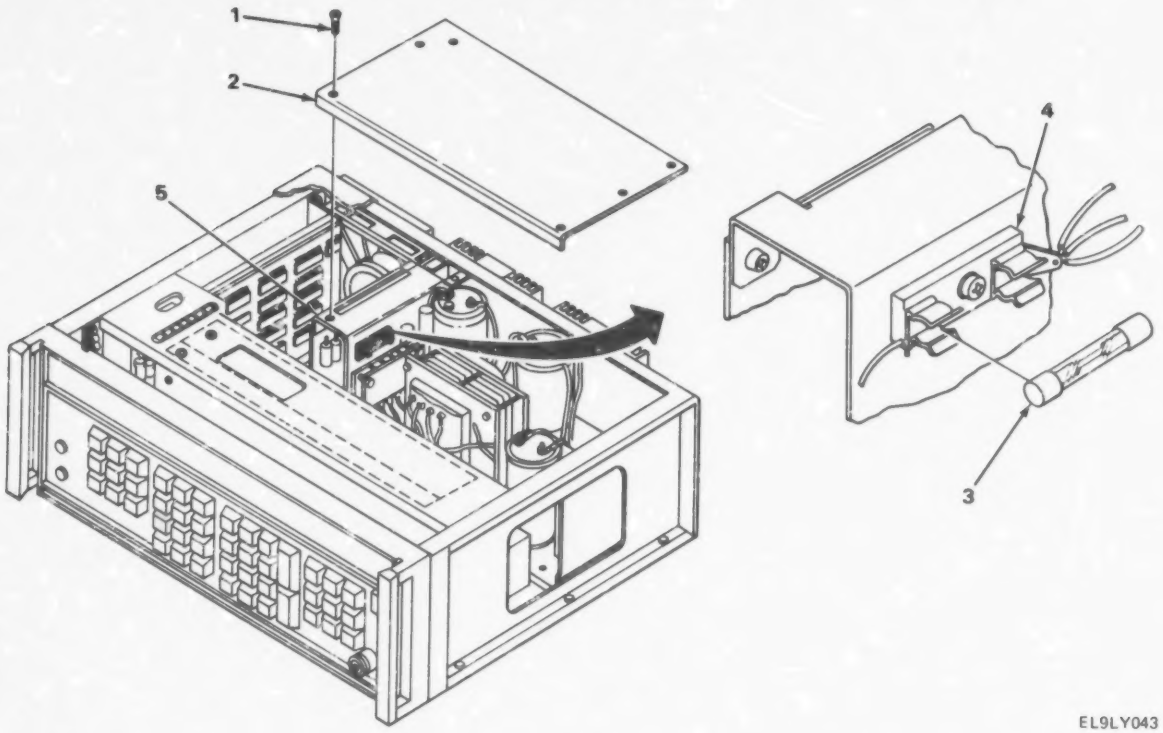
2-36. POWER SUPPLY FUSE A5A1F1 REPLACEMENT.

MATERIALS/PARTS: Fuse, A5A1F1 (FO2A32V20A5)
PRELIMINARY PROCEDURE: Remove dust cover (para 2-28).



EL9LY043

REMOVAL

WARNING

Capacitors within the power supply could hold a substantial residual electrical charge. Before performing any maintenance task, deplete any residual charge. Injury or damage to equipment could result.

1. Remove six screws (1) and power supply cover (2).
2. Pull fuse (3) free from fuseholder (4).

INSTALLATION

1. Position fuse (3) in fuseholder (4) and push into place.
2. Position power supply cover (2) on A5 assembly (5) and install six screws (1).

FOLLOW-ON MAINTENANCE: Install dust cover (para 2-28).

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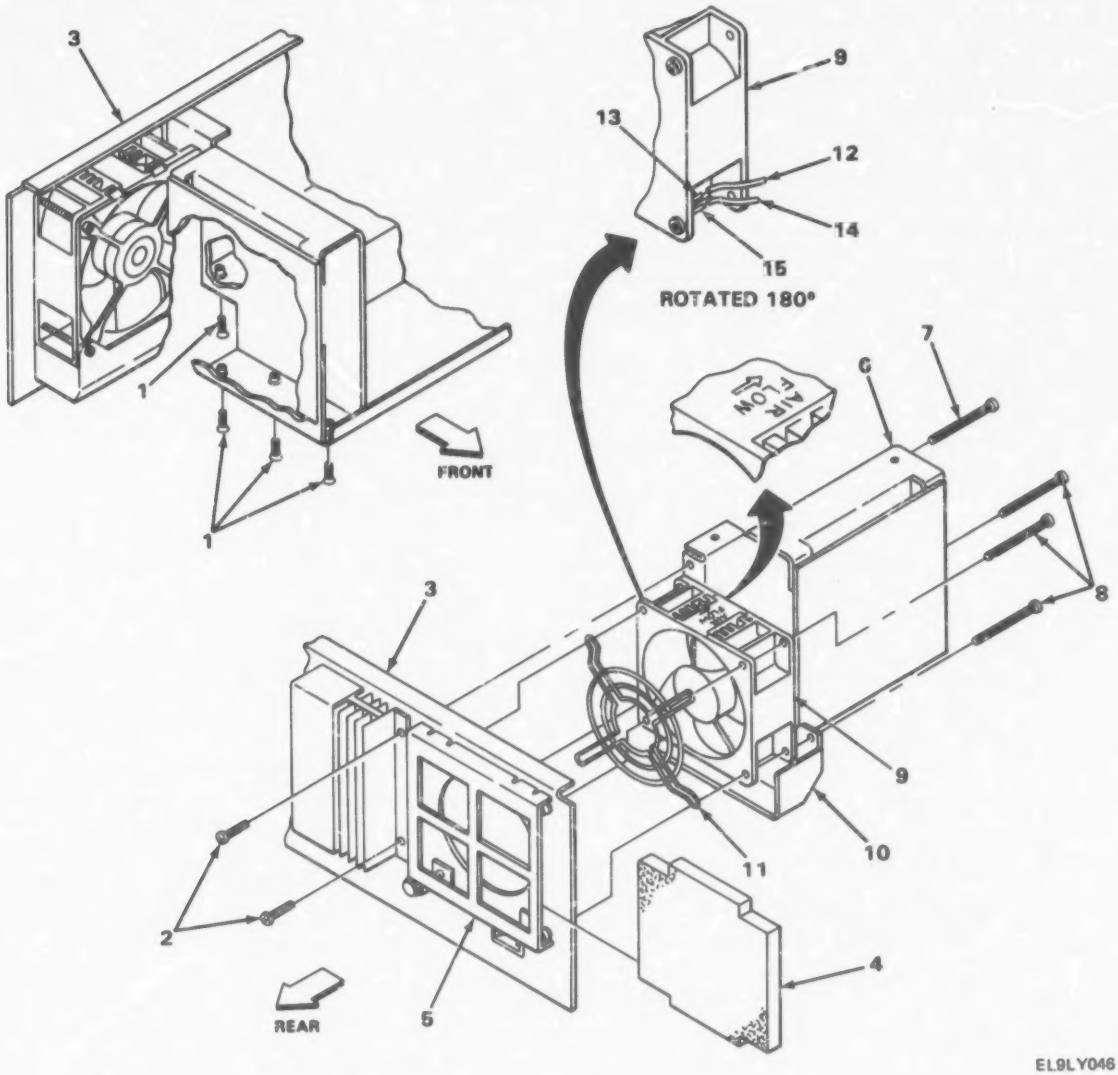
2-37. POWER SUPPLY FAN B1 REPLACEMENT.

MATERIALS/PARTS: Fan, tube axial, B1 (PN 028021 or 476042)
PRELIMINARY PROCEDURE: Remove power supply assembly A5 (para 2-34).



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2-37. POWER SUPPLY FAN B1 REPLACEMENT. (CONT)

REMOVAL

1. Remove four screws (1) from bottom of chassis.
2. Remove two screws (2) from back plate (3).
3. Remove filter element (4) from element holder (5).

NOTE

Raise circuit board assembly A5A1 (6) as needed to gain access to upper right fan screw (7).

When performing next step, hold four rubber nut grommets to keep from turning.

4. Remove four long screws (7) and (8) and pull fan (9) free from back plate (3).
5. Remove cover (10) and grille (11).
6. Unsolder wht/red wire (12) from terminal (13) and grey wire (14) from terminal (15) and remove fan (9).

INSTALLATION

NOTE

Position fan wires as shown. Reversing wires will cause fan to operate in reverse.

1. Solder grey wire (14) to terminal (15) and wht/red wire (12) to terminal (13).

NOTE

Position fan with airflow arrow pointing toward chassis and wht/red wire (12) and grey wire (14) at right lower corner.

Grille must be positioned with concave side toward fan.

2. Position grille (11) and cover (10) on fan (9) and position assembly on back plate (3).

NOTE

When performing next step, hold four rubber nut grommets to keep from turning.

3. Install four long screws (7) and (8).
4. Position circuit board assembly A5A1 (6) and install two screws (2) and four screws (1).
5. Install filter element (4) in element holder (5).

FOLLOW-ON MAINTENANCE: Install power supply assembly A5 (para 2-34).

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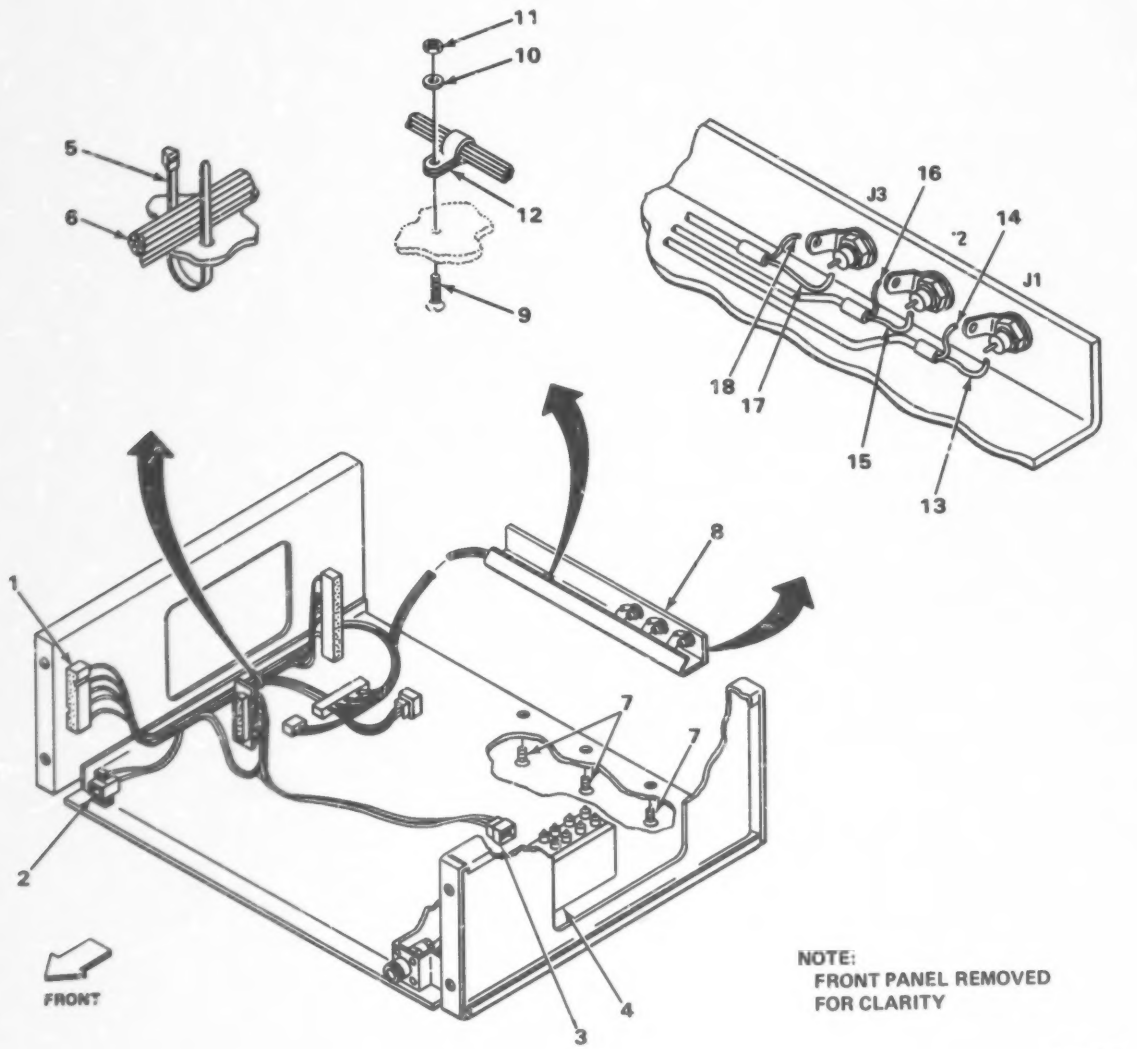
2-38. WIRE HARNESS ASSEMBLY REPLACEMENT.

MATERIALS/PARTS: Harness, wire, assembly (PN 629-9775-001)
PRELIMINARY PROCEDURE: Remove controller/audio assembly A2 (para 2-35).
Remove rf modulator assembly A3 and synthesizer assembly A4 (para 2-33).
Remove power supply assembly A5 (para 2-34).



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2-38. WIRE HARNESS ASSEMBLY REPLACEMENT. (CONT)

REMOVAL

NOTE

Front panel is removed for clarity.

1. Unplug connector P6 (1) and connector J4 (2) from front panel A1.
2. Unplug connector P7 (3) from A6AT1 assembly (4).
3. Cut and discard tie wrap (5) from wire harness (6).
4. Remove three screws (7) from bottom of chassis and lift channel (8) off chassis.
5. Remove two screws (9), flat washers (10), and locknuts (11).
6. Remove two loop clamps (12) from wire harness (6).
7. Unsolder wires from three BNC connectors as shown in table below.

BNC CONNECTOR NUMBER	WIRE COLOR	INDEX NUMBER
J1	BRN	13
	BLK	14
J2	WHT	15
	BLK	16
J3	GRN	17
	BLK	18

8. Remove wire harness (6) from chassis.

INSTALLATION

1. Solder wires to three BNC connectors as shown in table above.
2. Install two loop clamps (12) on wire harness (6).
3. Install two screws (9), flat washers (10), and locknuts (11).
4. Position channel (8) on chassis and install three screws (7) through bottom of chassis.
5. Route wire harness (6) as shown in illustration and install tie wrap (5).
6. Plug connector P7 (3) into A6AT1 assembly (4).
7. Plug connector J4 (2) and connector P6 (1) into front panel A1.

FOLLOW-ON MAINTENANCE: Install power supply A5 (para 2-34).
Install rf modulator assembly A3 and synthesizer assembly A4 (para 2-33).
Install controller/audio assembly A2 (para 2-35).

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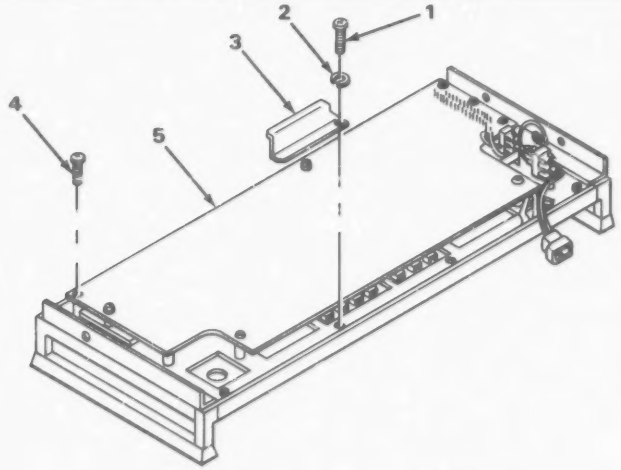
2-39. FRONT PANEL PUSHBUTTON SWITCH REPLACEMENT.

MATERIALS/PARTS: See chart below.
PRELIMINARY PROCEDURE: Remove front panel assembly A1 (para 2-29).

SWITCH PLACARD	SWITCH NO.	PART NO.	SWITCH PLACARD	SWITCH NO.	PART NO.
30 Hz VAR	S1	DC51-64	SLOW INCR	S26	DC51-01
9960 FM	S2	DC51-64	400 Hz	S27	DC51-64
9960 Hz	S3	DC51-64	1300 Hz	S28	DC51-64
% MOD	S4	DC51-64	3000 Hz	S29	DC51-64
STD	S5	DC51-01	+ 10° STEP	S30	DC51-01
RDL/DDM	S6	DC51-64	+	S31	DC51-01
7	S7	DC51-01	(blank)	S32	DC51-64
8	S8	DC51-01	1	S33	DC51-01
9	S9	DC51-01	2	S34	DC51-01
ENTER (shared with S23)	S10	DC51-01	3	S35	DC51-01
RF FREQ	S11	DC51-64	CLEAR (shared with S49)	S36	DC51-01
LOC/GS	S12	DC51-01	dBmW/μV	S37	DC51-01
ΔF	S13	DC51-64	FAST DECR	S38	DC51-01
1020 Hz	S14	DC51-64	SLOW DECR	S39	DC51-01
90 Hz	S15	DC51-64	-10° STEP	S43	DC51-01
150 Hz	S16	DC51-64	+	S44	DC51-01
STEP xRDL xDDM	S17	DC51-01	(blank)	S45	DC51-64
T/F U/L D/R	S18	DC51-01	0	S46	DC51-01
Δ ILS PH	S19	DC51-64	•	S47	DC51-01
4	S20	DC51-01	(blank)	S48	DC51-64
5	S21	DC51-01	CLEAR (shared with S36)	S49	DC51-01
6	S22	DC51-01			
ENTER (shared with S10)	S23	DC51-01			
RF ON/OFF	S24	DC51-01			
FAST INCR	S25	DC51-01			



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2-39. FRONT PANEL PUSHBUTTON SWITCH REPLACEMENT. (CONT)

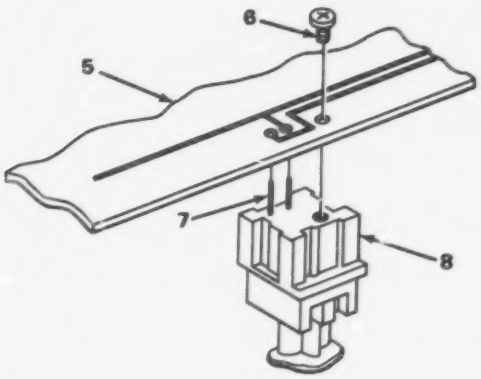
REMOVAL

NOTE

Steps given are typical for all switches.

When replacing ENTER or CLEAR switches, switch actuating lens must be removed first.

1. Remove two screws (1), lockwashers (2), and bracket (3).
2. Remove eight screws (4) from circuit board (5).



EL9LY049

3. Remove switch-retaining screw (6).
4. Unsolder switch pins (7) from circuit board (5).
5. Raise circuit board (5) and remove switch (8).

INSTALLATION

NOTE

Steps given are typical for all switches.

When performing next step, switch pins must pass through circuit board.

1. Position switch (8) on circuit board (5) and push into place.
2. Install switch-retaining screw (6).
3. Solder switch pins (7) to circuit board (5).

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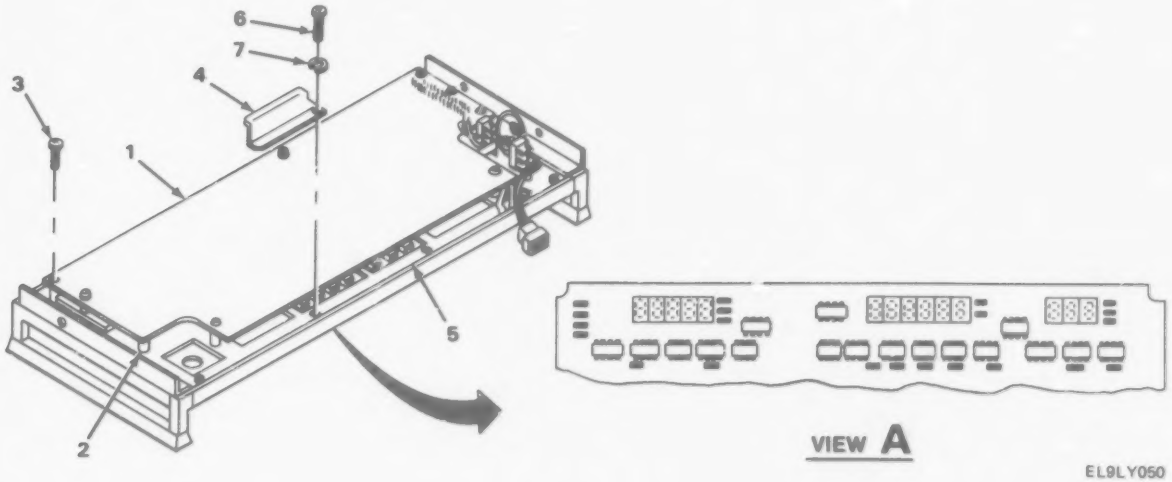
2-39. FRONT PANEL PUSHBUTTON SWITCH REPLACEMENT. (CONT)

INSTALLATION (CONT)



CAUTION

When performing next step, aline 21 LEDs with alinement slots in front panel. Extreme care must be taken not to bend any of the LEDs. A bent LED will prevent proper seating of circuit board (view A).

4. Turn circuit board (1) over and position on standoffs (2).
5. Install eight screws (3).
6. Position bracket (4) on front panel (5) and install two screws (6) and lockwashers (7).

FOLLOW-ON MAINTENANCE: Install front panel assembly A1 (para 2-29).

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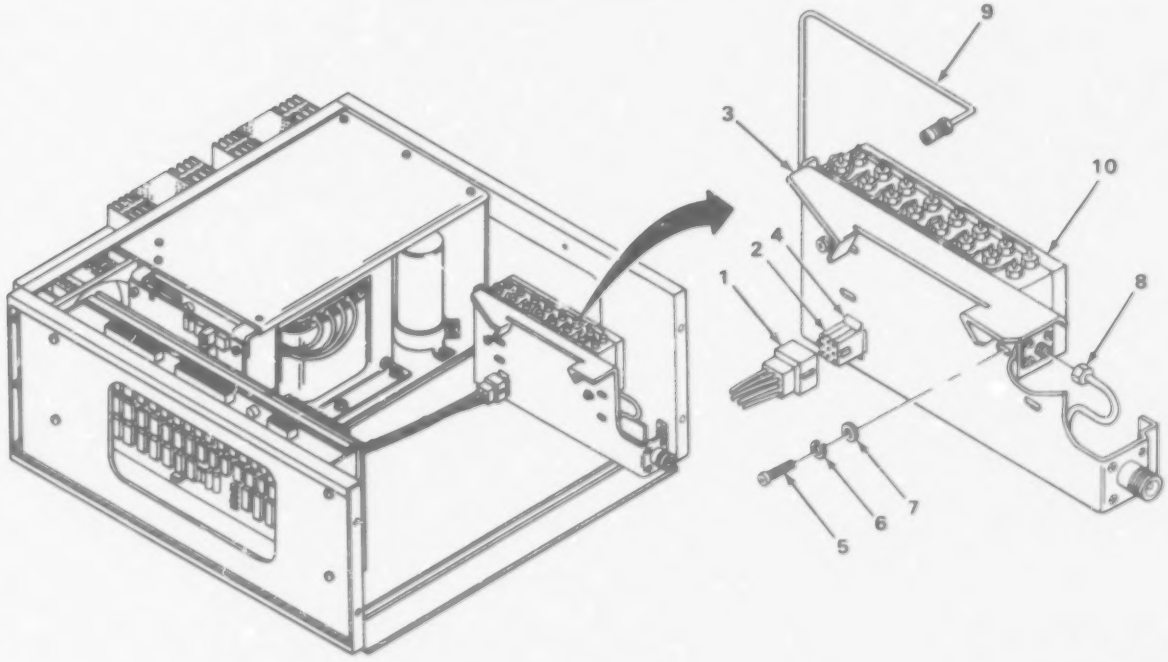
2-40. ATTENUATOR ASSEMBLY A6AT1 REPLACEMENT.

MATERIALS/PARTS: Attenuator, digital control, assembly A6AT1 (PN PA588SMA)
PRELIMINARY PROCEDURE: Remove front panel assembly A1 (para 2-29).
Remove rf modulator assembly A3 and synthesizer assembly A4 (para 2-33).



EL9LY044

REMOVAL

1. Disconnect connector P7 (1) from connector (2) on A6AT1 bracket (3).
2. Push down top lock tab (4) of connector (2) and push connector through hole.
3. Remove two screws (5), lockwashers (6), and flat washers (7).
4. Disconnect rf output cable (8) and coaxial cable (9).
5. Remove A6AT1 assembly (10).

INSTALLATION

1. Push connector (2) through hole in A6AT1 bracket (3) until both lock tabs are pushed through hole.
2. Position A6AT1 assembly (10) on A6AT1 bracket (3).
3. Connect coaxial cable (9) and rf output cable (8) to A6AT1 assembly (10).
4. Install two screws (5), lockwashers (6), and flat washers (7).
5. Connect connector P7 (1) to connector (2) on A6AT1 bracket (3).

FOLLOW-ON MAINTENANCE: Install rf modulator assembly A3 and synthesizer assembly A4 (para 2-33).
Install front panel assembly A1 (para 2-29).

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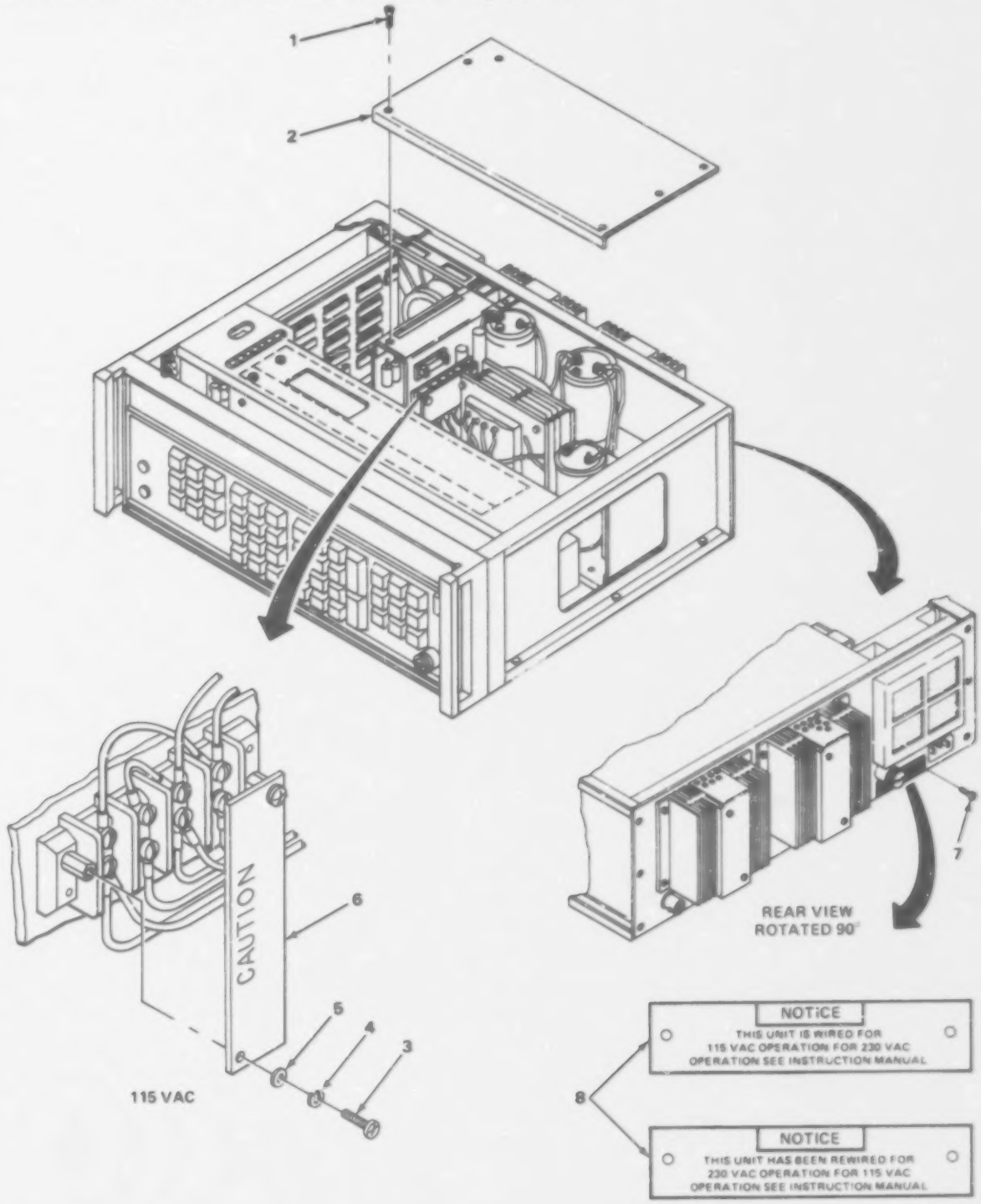
2-41. REWIRING TEST SET FOR 230 VAC OPERATION.

MATERIALS/PARTS: 2-amp, 250 vac fuse (PN F02A250V2A)
PRELIMINARY PROCEDURE: Remove dust cover (para 2-28).



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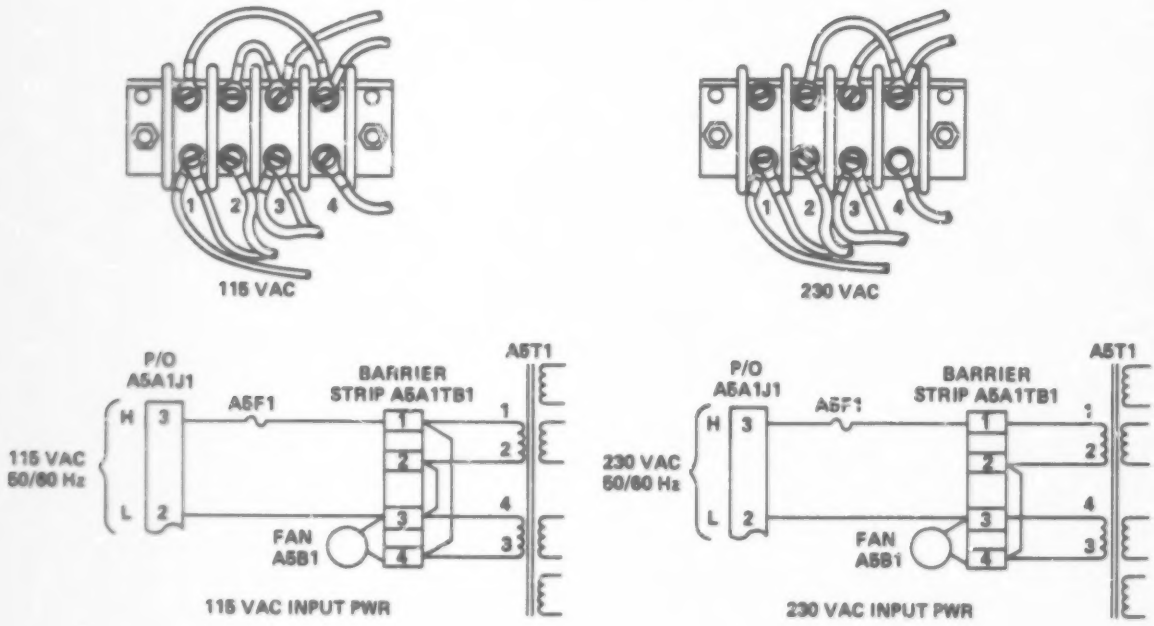
2-41. REWIRING TEST SET FOR 230 VAC OPERATION. (CONT)



DETAIL A

EL9LY080

NOTE

The test set is factory wired for 115 vac operation. The following procedure converts the test set to 230 vac operation. Both configurations are covered here.

1. Remove six screws (1) and remove power supply cover (2).
2. Remove one screw (3), lockwasher (4), and flat washer (5).
3. Move barrier strip (6) down and out of way.
4. Rewire for 230 vac or 115 vac operation as shown in detail A. Retain jumper wire.

CAUTION

Make sure all screws on terminal board are tight.

5. Move barrier strip (6) into position and install one screw (3), lockwasher (4), and flat washer (5).
6. If 230 vac operation is selected, remove A5F1 fuse from fuseholder and replace with a 2-amp, 250 vac fuse.
7. Remove two screws (7) and turn NOTICE plate (8) to display operation selected.
8. Position power supply cover (2) on power supply and install six screws (1).

FOLLOW-ON MAINTENANCE: Install dust cover (para 2-28).

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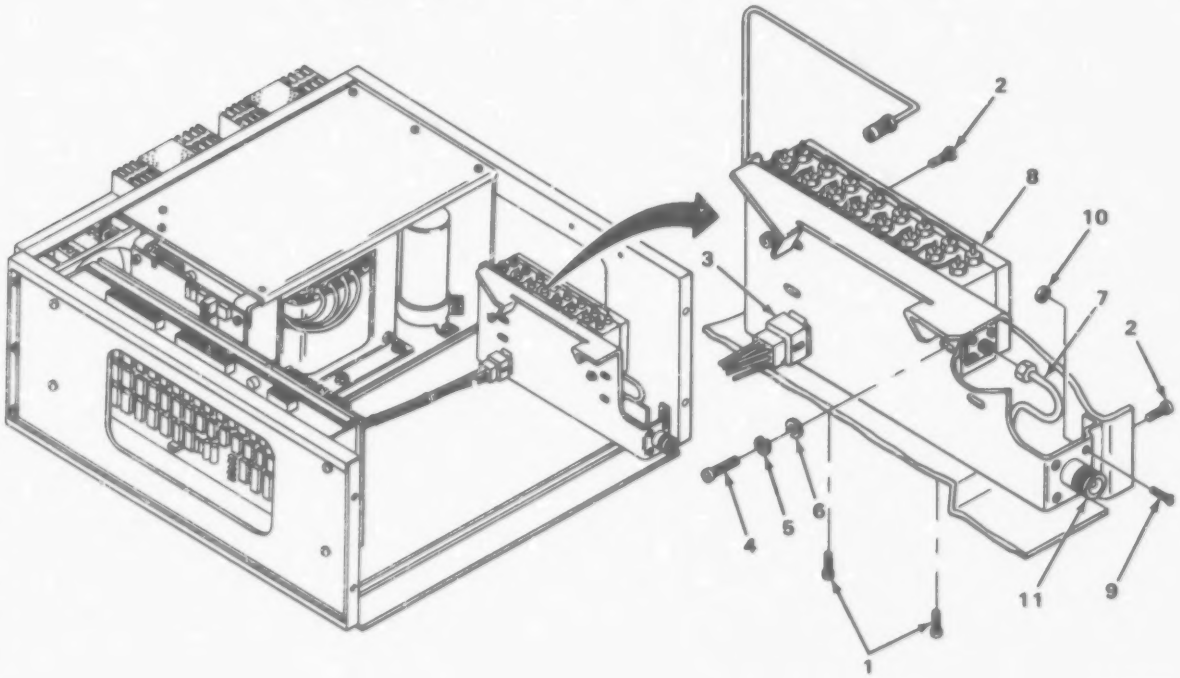
2-42. RF OUTPUT CONNECTOR A6J5 REPLACEMENT.

MATERIALS/PARTS: Connector, jack, A6J5 (PN KN19-154MO6)
PRELIMINARY PROCEDURE: Remove front panel (para 2-29).
Remove rf modulator assembly A3 and synthesizer assembly A4 (para 2-33).



EL0LY045

REMOVAL

1. Remove two screws (1) from bottom of chassis and two screws (2) from side of chassis and move A6AT1 bracket (3) to side.
2. Remove two screws (4), lockwashers (5), and flat washers (6).
3. Disconnect rf cable (7) from A6AT1 assembly (8).
4. Remove four screws (9) and locknuts (10) and remove rf connector (11).

INSTALLATION

1. Position rf connector (11) on A6AT1 bracket (3) and install four screws (9) and locknuts (10).
2. Connect rf cable (7) to A6AT1 assembly (8).
3. Position A6AT1 assembly (8) on A6AT1 bracket (3) and install two screws (4), lockwashers (5), and flat washers (6).
4. Position A6AT1 bracket (3) in chassis and install two screws (2) through side of chassis and two screws (1) through bottom of chassis.

FOLLOW-ON MAINTENANCE: Install rf modulator assembly A3 and synthesizer assembly A4 (para 2-33).
Install front panel (para 2-29).

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APPENDIX A

REFERENCES

A-1. SCOPE.

This appendix lists all pamphlets, forms, service catalogues, service bulletins, technical bulletins, and technical manuals referenced in this manual.

A-2. PAMPHLETS.

Consolidated Index of Army Publications and Blank Forms	DA PAM 310-1
The Army Maintenance Management System (TAMMS)	DA PAM 738-750

A-3. FORMS.

Recommended Changes to Publications and Blank Forms	DA FORM 2028
Recommended Changes to Equipment Technical Manuals	DA FORM 2028-2
Equipment Inspection and Maintenance Worksheet	DA FORM 2404
Discrepancy in Shipment Report (DISREP)	SF 361
Report of Discrepancy (ROD)	SF 364
Quality Deficiency Report	SF 368

A-4. SERVICE CATALOGUES.

Tool Kit Calibration and Repair (NSN 5180-00-670-7123)	SC 4935-95CL-A4

A-5. SERVICE BULLETINS.

Painting and Preservation Supplies Available for Field Use for Electronics Command Equipment	SB 11-573
Preservation, Packaging, Packing, and Marking Materials, Supplies, and Equipment Used by the Army	SB 38-100

A-6. TECHNICAL BULLETINS.

Calibration Procedure for Receiver Test Set AN/ARM-180 (Collins, Model 4795-6)	TB 9-6625-2076-35
Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern Painting of Electrical Equipment Shelters	TB 43-0118

A-7. TECHNICAL MANUALS.

Operator's and Organizational Maintenance Manual: Test Set, Receiver AN/ARM-180 (NSN 6625-01-041-4161)	TM 11-6625-2975-12
Organizational, Direct Support, and General Support Maintenance Repair Parts and Special Tools Lists for Test Set Receiver AN/ARM-186 (NSN 6625-00-537-1163)	TM 11-6625-2976-24P
Administrative Storage of Equipment	TM 740-90-1
Procedure for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command)	TM 750-244-2

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APPENDIX B

EXPENDABLE SUPPLIES AND MATERIALS LIST

B-1. SCOPE.

This appendix lists expendable supplies and materials you will need to maintain the Test Set, Receiver AN/ARM-180. These items are authorized to you by CTA 50-970. Expendable items (except Medical, Class V, Repair Parts, and Heraldic Items).

B-2. EXPLANATION OF COLUMNS.

a. Column (1), Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (for example, "Use cleaning compound, item 6, appendix B").

b. Column (2), Level. This column identifies the lowest level of maintenance that requires the listed item.

H – General Support Maintenance

c. Column (3), National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column (4), Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

e. Column (5), Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (eg, ea, in., pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

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EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION (FSCM)	(5) U/M
1	H	5905-00-293-4208	WIRE, NONELECTRICAL (SAFETY WIRE)	LB
2	H	5970-00-816-6056	INSULATION TAPE, ELECTRICAL, PLASTIC	FT
3	H	7510-00-290-8036	PRESSURE SENSITIVE TAPE, FILAMENT REINFORCED	YD (60)
4	H	6850-00-105-3084	CLEANING COMPOUND, FREON TF (TRICHLOROTRIFLUOROETHANE)	OZ (16)
5	H	6850-00-984-5853	CLEANING COMPOUND, FREON PCA (TRICHLOROTRIFLUOROETHANE)	GAL (5)
6	H	8040-00-843-0802	ADHESIVE/SEALER SILICON	TUBE (3 OZ)

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GLOSSARY

Section I ABBREVIATIONS

atten	attenuator
cpu	central processing unit
dB	decibel
DDM	difference in depth of modulation
DSCR	decrease
D/R	down/right
GS	glide slope
ILS	instrument landing system
INCR	increase
I/O	input/output
LED	light emitting diode
LOC	localizer
MB	marker beacon
OC	on course
PH	phase
PWR	power
U/L	up/left
VAR	variable
VHF	very high frequency
VOR	very high frequency omnidirectional range

Section II DEFINITION OF UNUSUAL TERMS

Address. A pattern of characters that identifies a storage location.

Auxiliary signal. 30 Hz reference signal used in VOR mode.

Azimuth. Horizontal direction.

Bus. A parallel group of signal lines, grouped together because of similarity of functions, which connect two assemblies or subassemblies.

Channel reject. Rejection of a radio frequency by navigational equipment.

Composite signal. Generated combined audio modulation signals.

Demodulation signal. The detected audio modulation with the rf carrier removed.

Omnidirectional range. A radio aid to navigation which indicates the magnetic bearing (omnibearing) of that station from any azimuth.

Read. The act of retrieving a data word from memory.

Write. The act of entering a data word into memory.

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

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Stateside, N.J. 07703-5007.

DATE SENT
10 July 1975

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/PRC-76

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PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO
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3-10	3-3		3-1
5-6	5-8		
		F03	

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°.

REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.

Item 5, Function column. Change "2 db" to "3db."

REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.

Add new step f.1 to read, "Replace cover plate removed in step e.1, above."

REASON: To replace the cover plate.

Zone C 3. On J1-2, change "+24 VDC to "+5 VDC."

REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

SAMPLE

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
SSG I. M. DeSpiritof 999-1776

SIGN HERE
I. M. DeSpiritof

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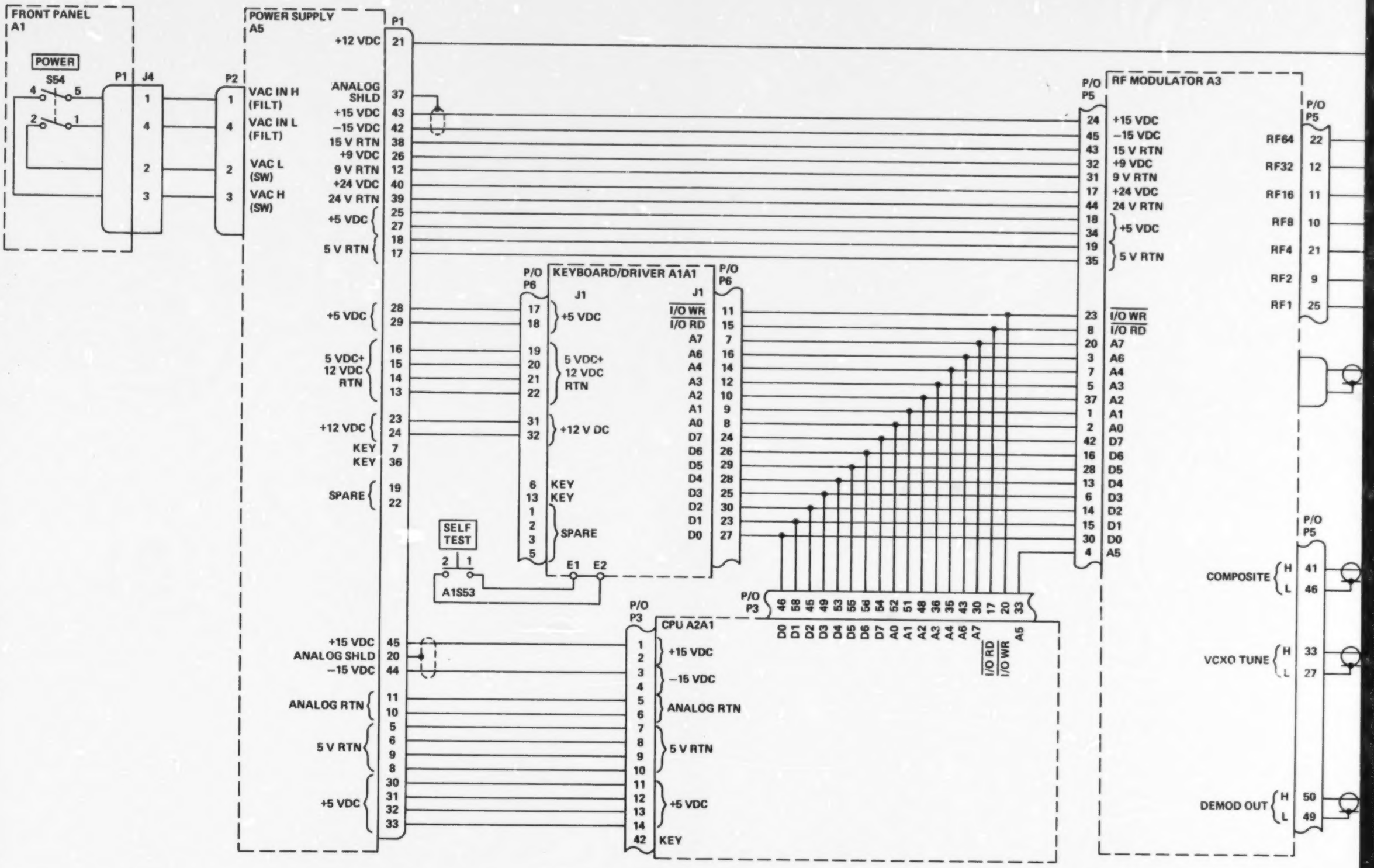
FRONT PANEL
A1
POWER
S54
4
5
2
1
P1
J4
1
4
2
3
P2
1
4
2
3
VAC IN H (FILT)
VAC IN L (FILT)
VAC L (SW)
VAC H (SW)
POWER SUPPLY
A5
P1
+12 VDC 21
ANALOG SHLD 37
+15 VDC 43
−15 VDC 42
15 V RTN 38
+9 VDC 26
9 V RTN 12
+24 VDC 40
24 V RTN 39
+5 VDC 25 27
5 V RTN 18 17
+5 VDC 28 29
5 VDC+ 12 VDC RTN 16 15 14 13
+12 VDC 23 24
KEY 7
KEY 36
SPARE 19 22
+15 VDC 45
ANALOG SHLD 20
−15 VDC 44
ANALOG RTN 11 10
5 V RTN 5 6 9 8
+5 VDC 30 31 32 33
P/O P6
KEYBOARD/DRIVER A1A1
J1
17 18 +5 VDC
19 20 21 22 5 VDC+ 12 VDC RTN
31 32 +12 V DC
6 13 KEY
1 2 3 5 SPARE
J1
I/O WR 11
I/O RD 15
A7 7
A6 16
A4 14
A3 12
A2 10
A1 9
A0 8
D7 24
D6 26
D5 29
D4 28
D3 25
D2 30
D1 23
D0 27
SELF TEST
2
1
A1S53
E1
E2
P/O P3
CPU A2A1
1 2 3 4 5 6 7 8 9 10 11 12 13 14 42
+15 VDC
−15 VDC
ANALOG RTN
5 V RTN
+5 VDC
KEY
P/O P3
46 58 45 49 53 55 56 54 52 51 48 36 35 43 30 17 20 33
D0 D1 D2 D3 D4 D5 D6 D7 A0 A1 A2 A3 A4 A6 A7 I/O RD I/O WR A5
P/O P5
RF MODULATOR A3
24 +15 VDC
45 −15 VDC
43 15 V RTN
32 +9 VDC
31 9 V RTN
17 +24 VDC
44 24 V RTN
18 34 +5 VDC
19 35 5 V RTN
23 I/O WR
8 I/O RD
20 A7
3 A6
7 A4
5 A3
37 A2
1 A1
2 A0
42 D7
16 D6
28 D5
13 D4
6 D3
14 D2
15 D1
30 D0
4 A5
P/O P5
RF64 22
RF32 12
RF16 11
RF8 10
RF4 21
RF2 9
RF1 25
P/O P5
COMPOSITE H 41 L 46
VCXO TUNE H 33 L 27
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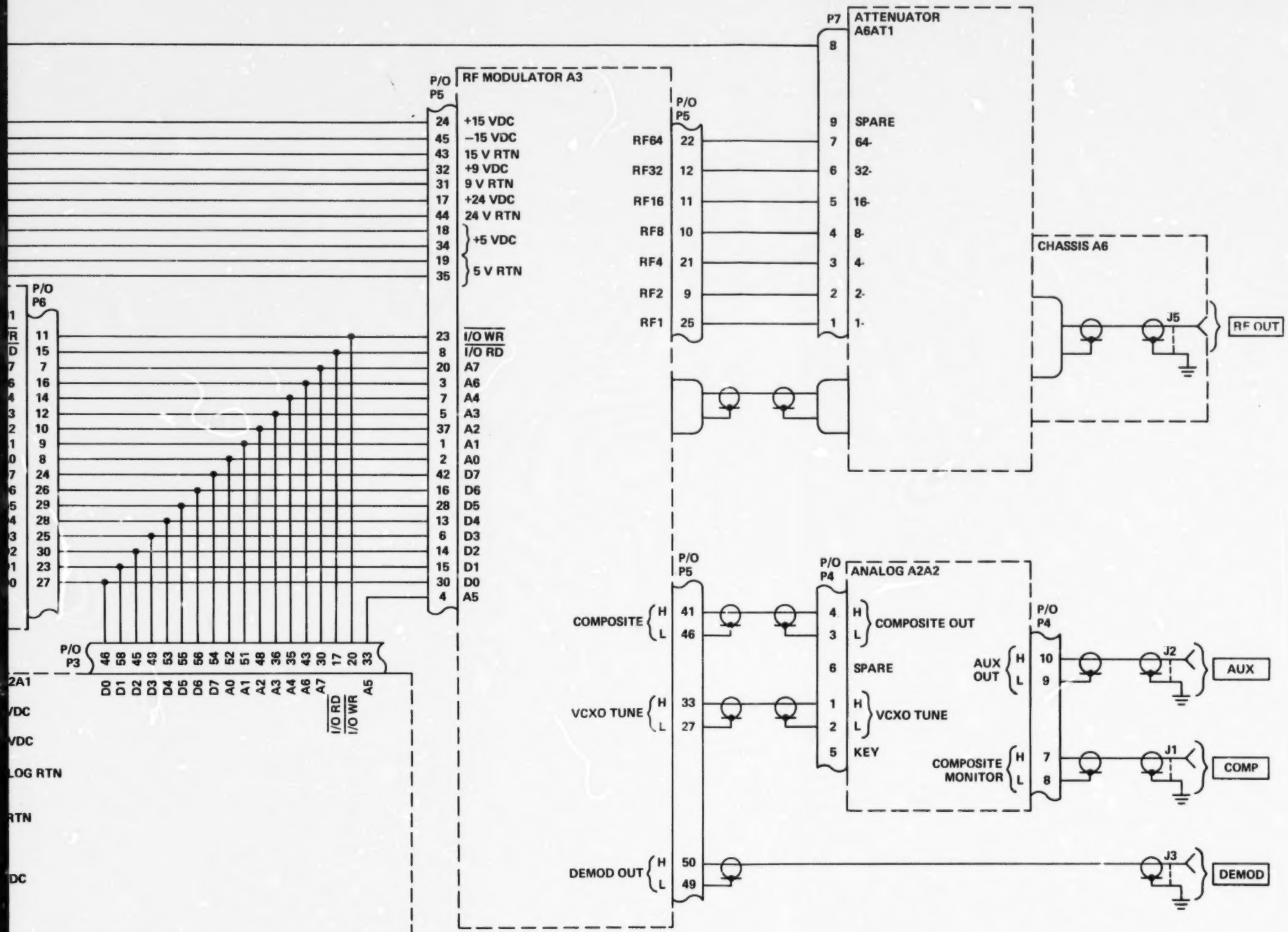

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FO-1. Wiring Harness, Schematic Diagram

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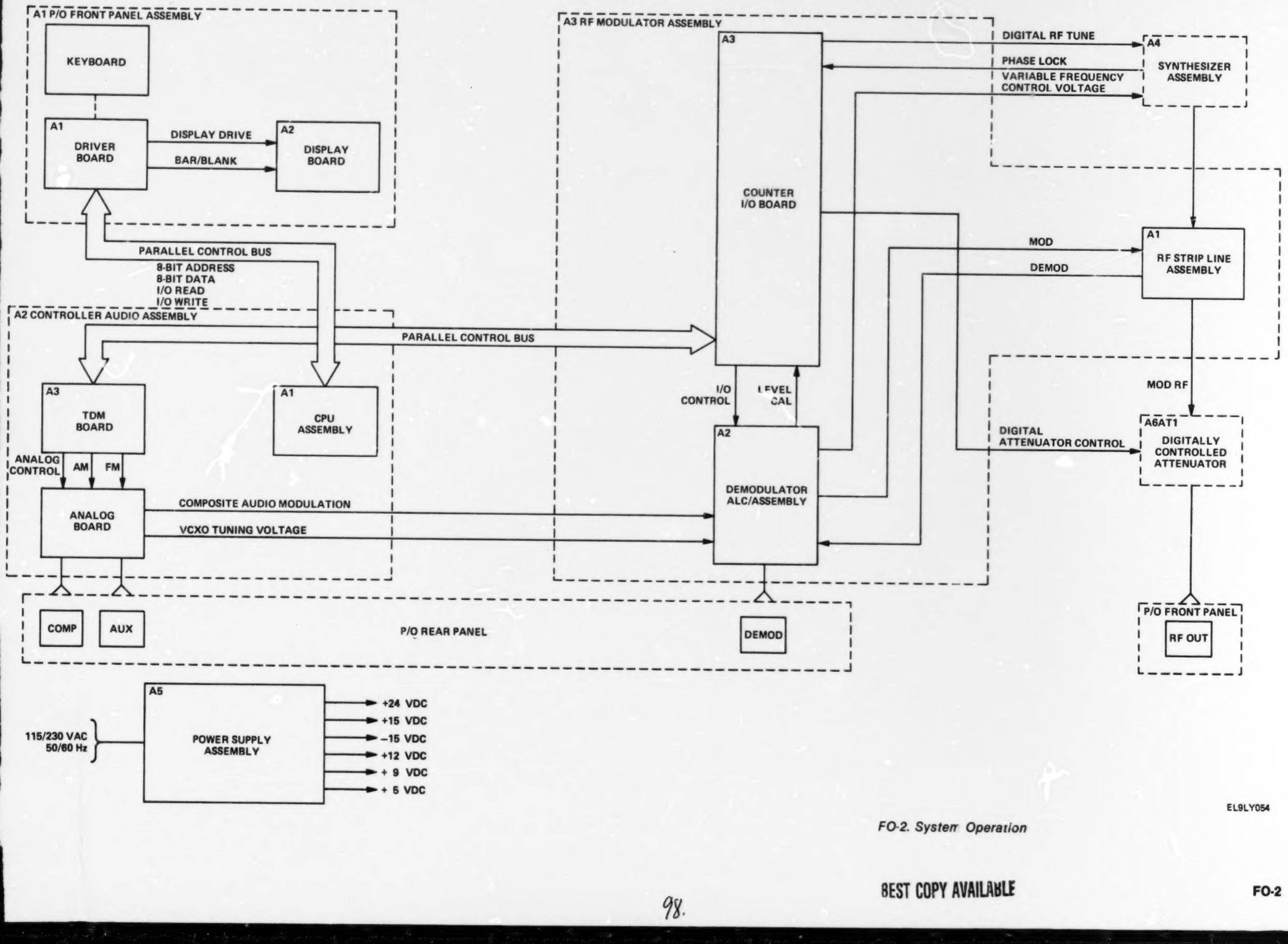

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FO-2. System Operation

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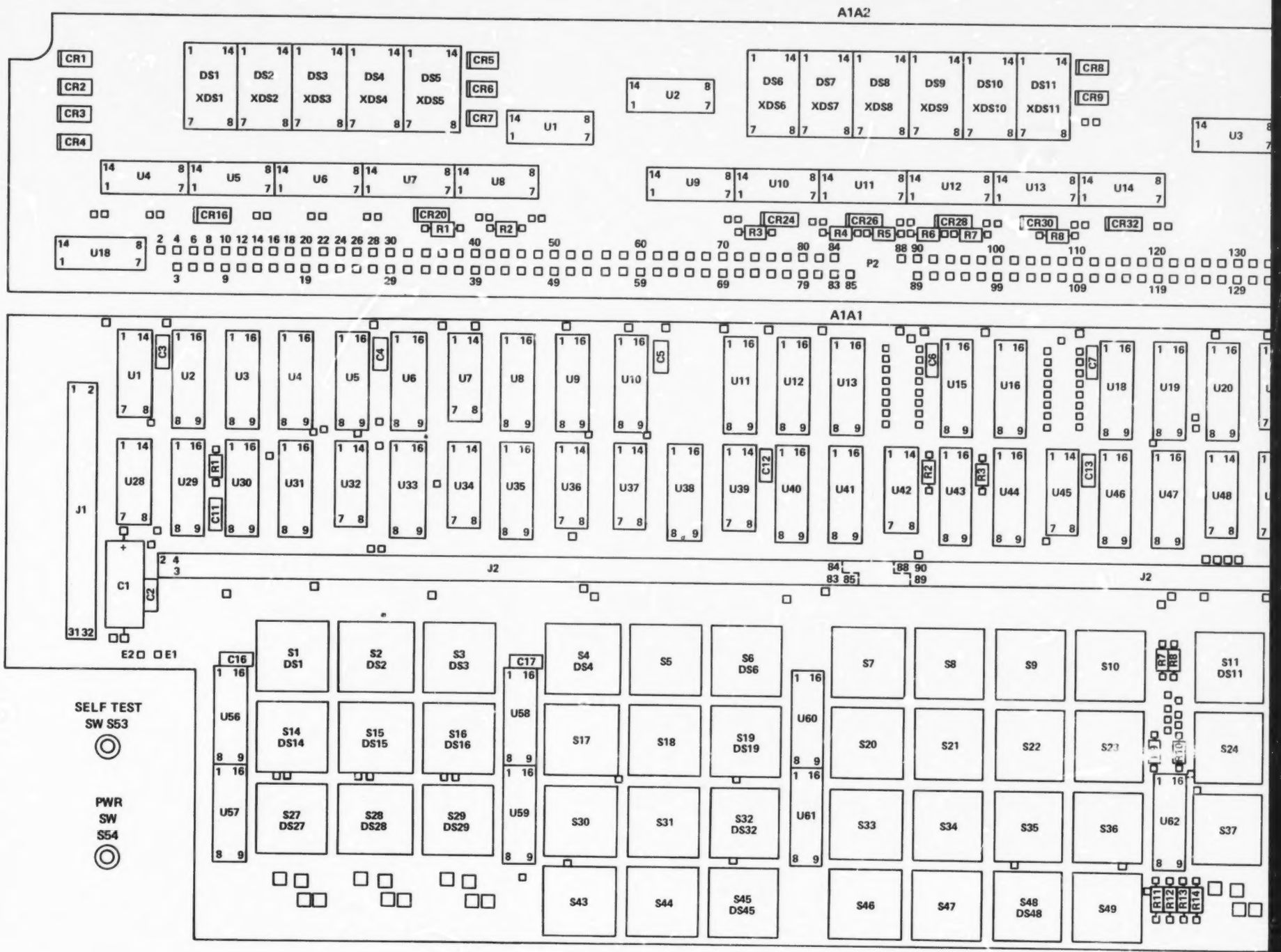
A1A2
CR1
CR2
CR3
CR4
DS1 XDS1
DS2 XDS2
DS3 XDS3
DS4 XDS4
DS5 XDS5
CR5
CR6
CR7
U1
U2
DS6 XDS6
DS7 XDS7
DS8 XDS8
DS9 XDS9
DS10 XDS10
DS11 XDS11
CR8
CR9
U3
U4
U5
U6
U7
U8
U9
U10
U11
U12
U13
U14
CR16
CR20
R1
R2
CR24
CR26
CR28
CR30
CR32
R3
R4
R5
R6
R7
R8
U18
P2
A1A1
J1
J2
C1
C2
C3
C4
C5
C6
C7
C11
C12
C13
R1
R2
R3
E1
E2
C16
C17
U56
U57
U58
U59
U60
U61
U62
S1 DS1
S2 DS2
S3 DS3
S4 DS4
S5
S6 DS6
S7
S8
S9
S10
S11 DS11
S14 DS14
S15 DS15
S16 DS16
S17
S18
S19 DS19
S20
S21
S22
S23
S24
S27 DS27
S28 DS28
S29 DS29
S30
S31
S32 DS32
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S49
SELF TEST SW S53
PWR SW S54

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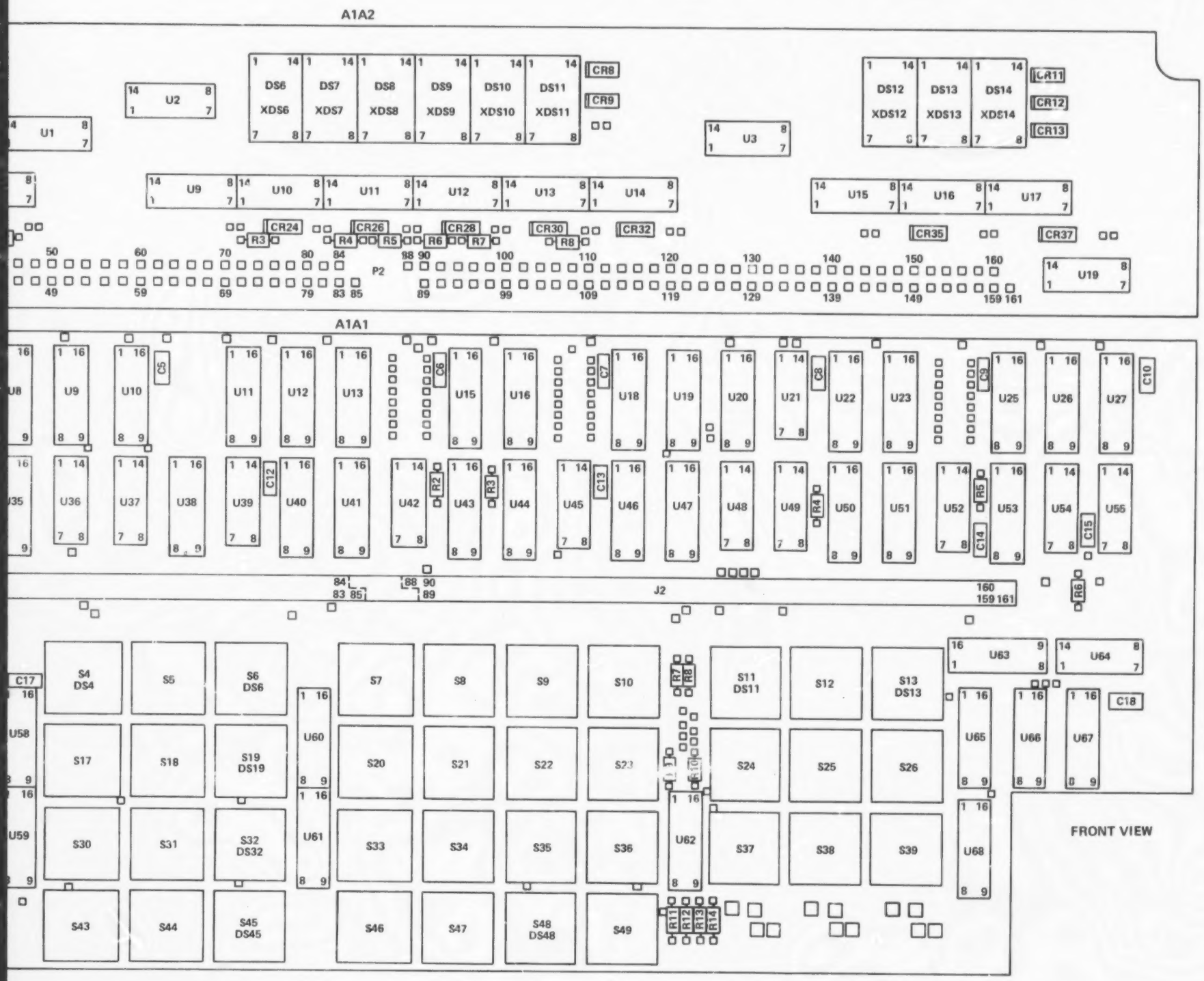

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FO-3. Front Panel Assembly A1, Schematic Diagram

99.

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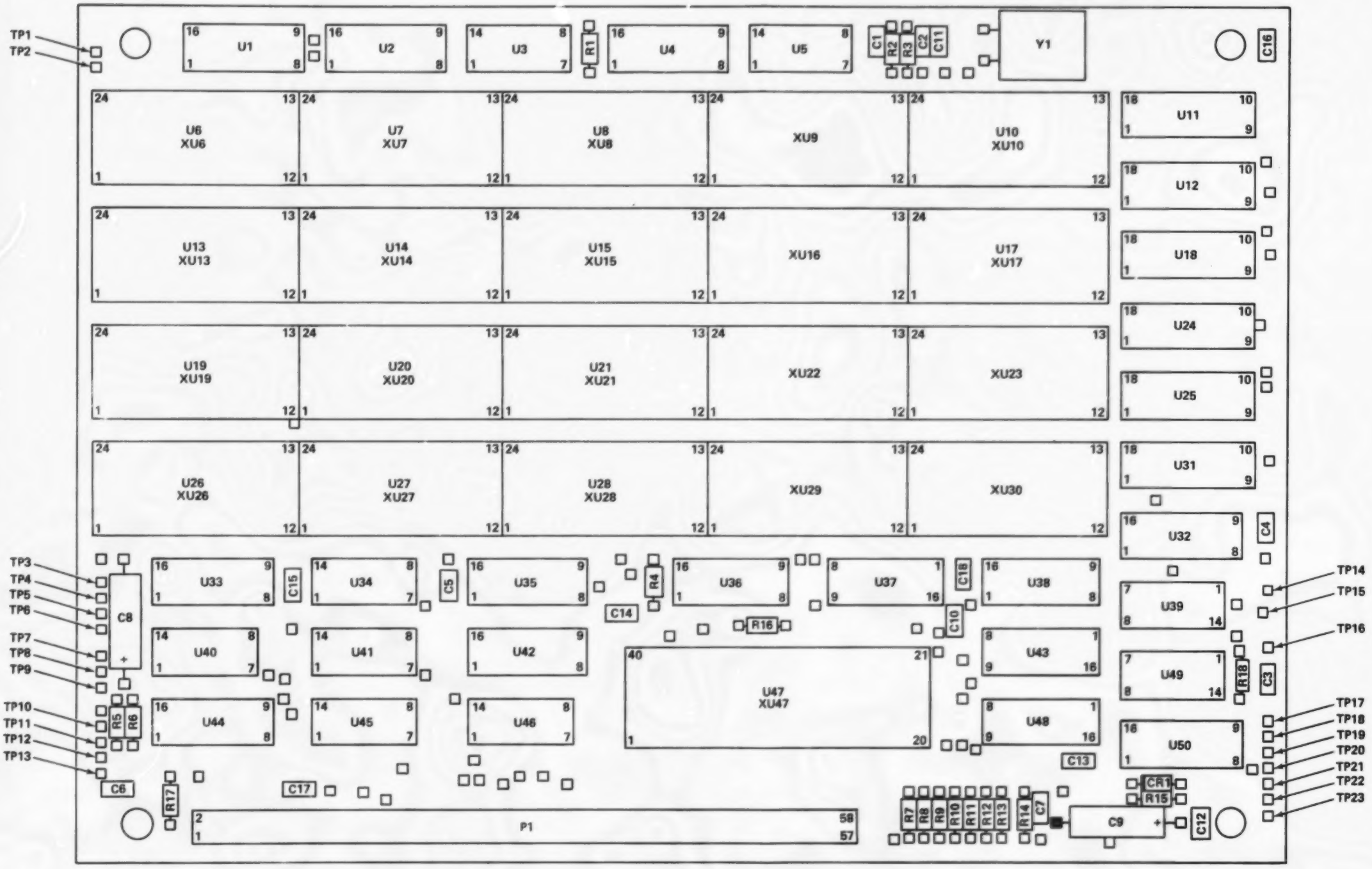

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FO-4. Controller/Audio Assembly A2, CPU Board Assembly A2A1, Schematic Diagram

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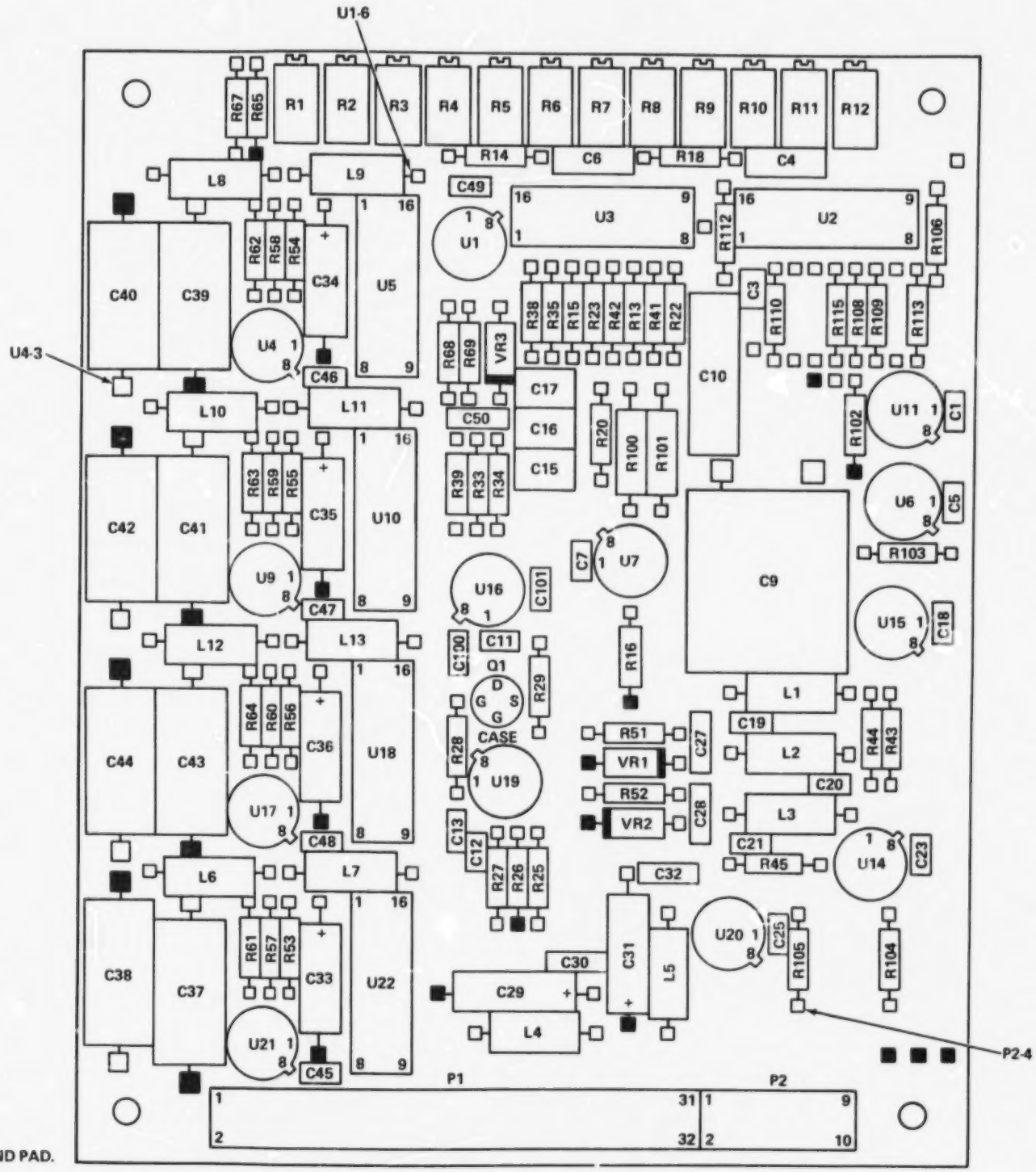

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FO-5. Controller/Audio Assembly A2, Analog Board A2A2, Schematic Diagram

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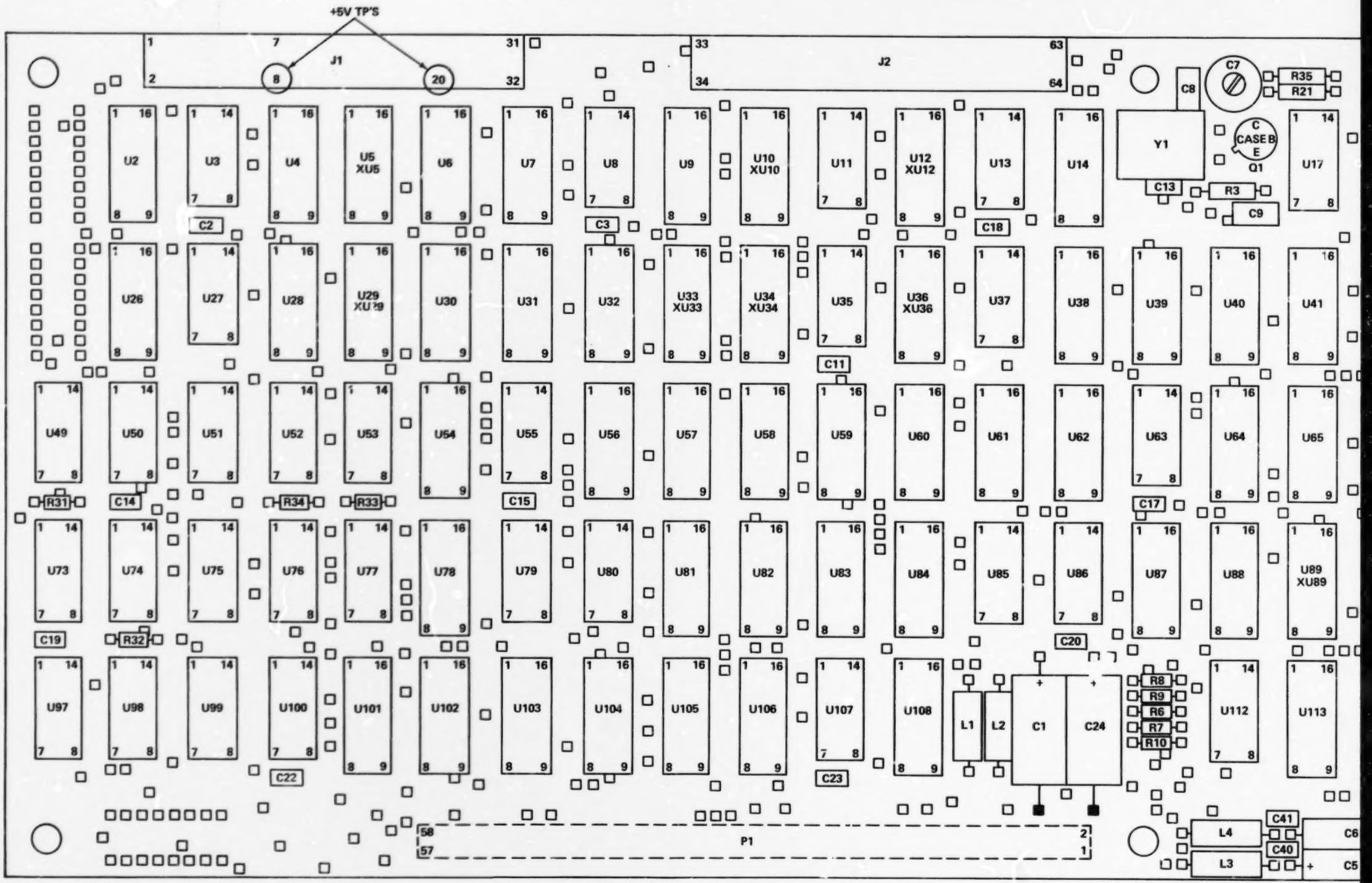

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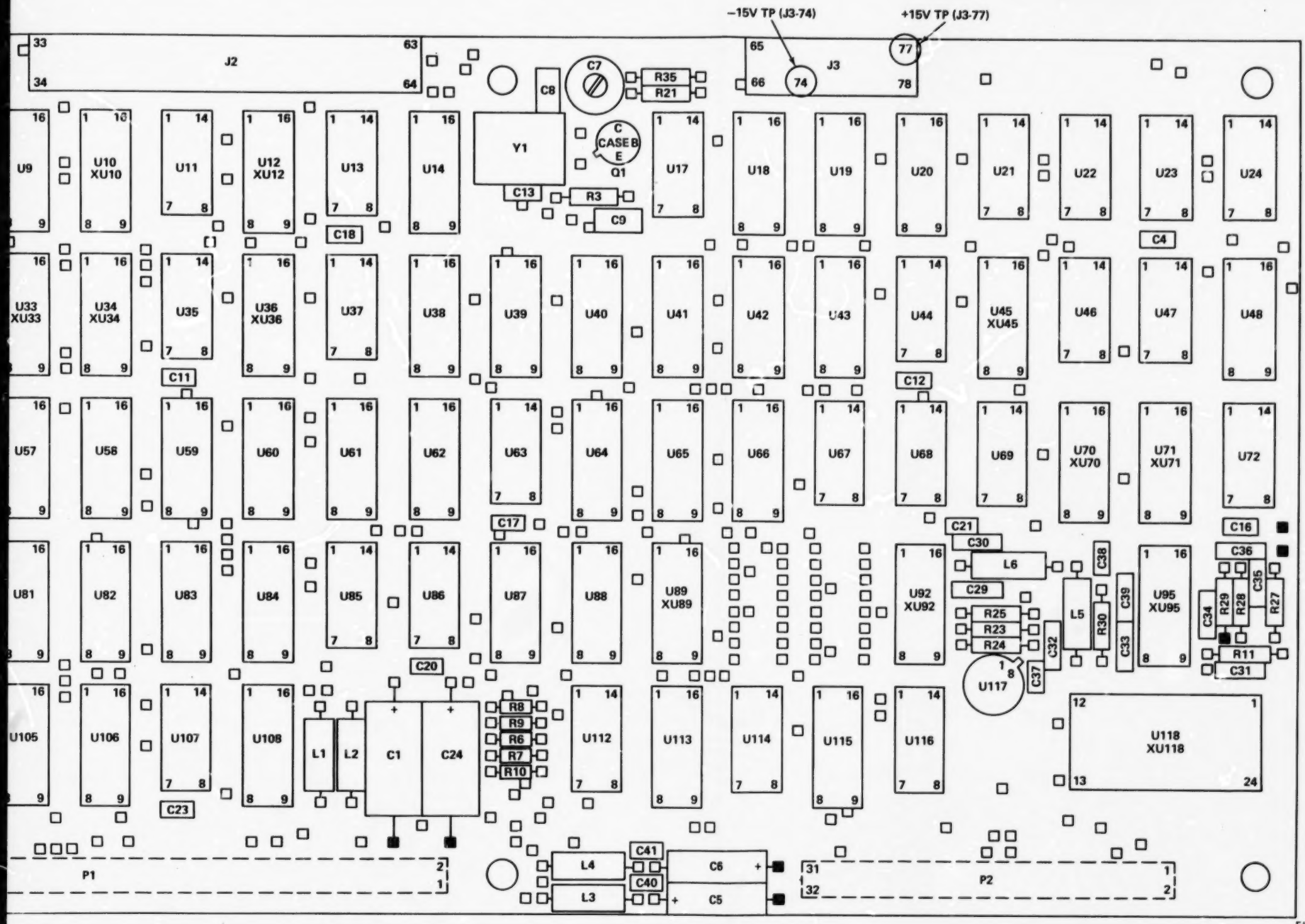

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FO-6. Controller/Audio Assembly A2, TDM Board A2A3, Schematic Diagram

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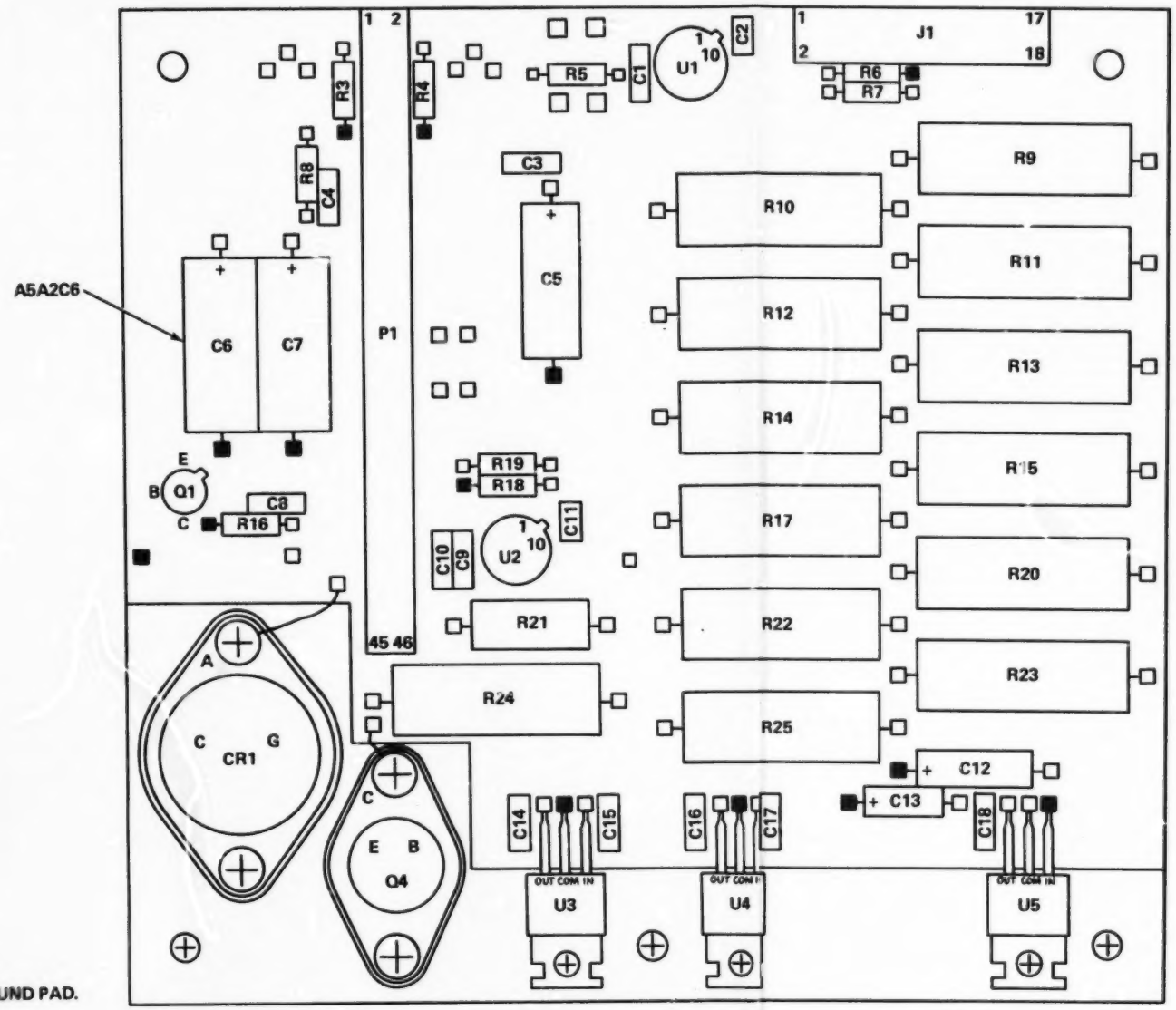

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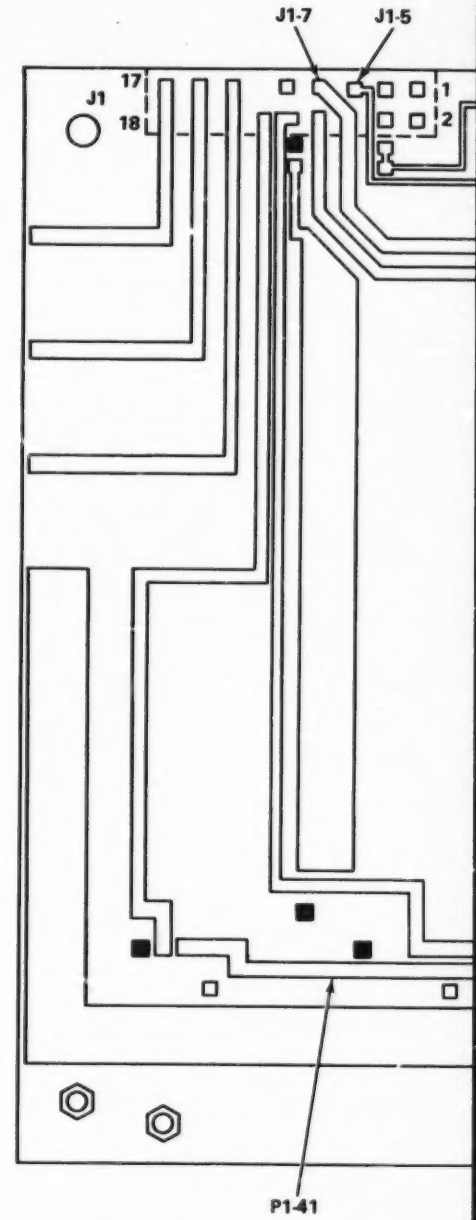
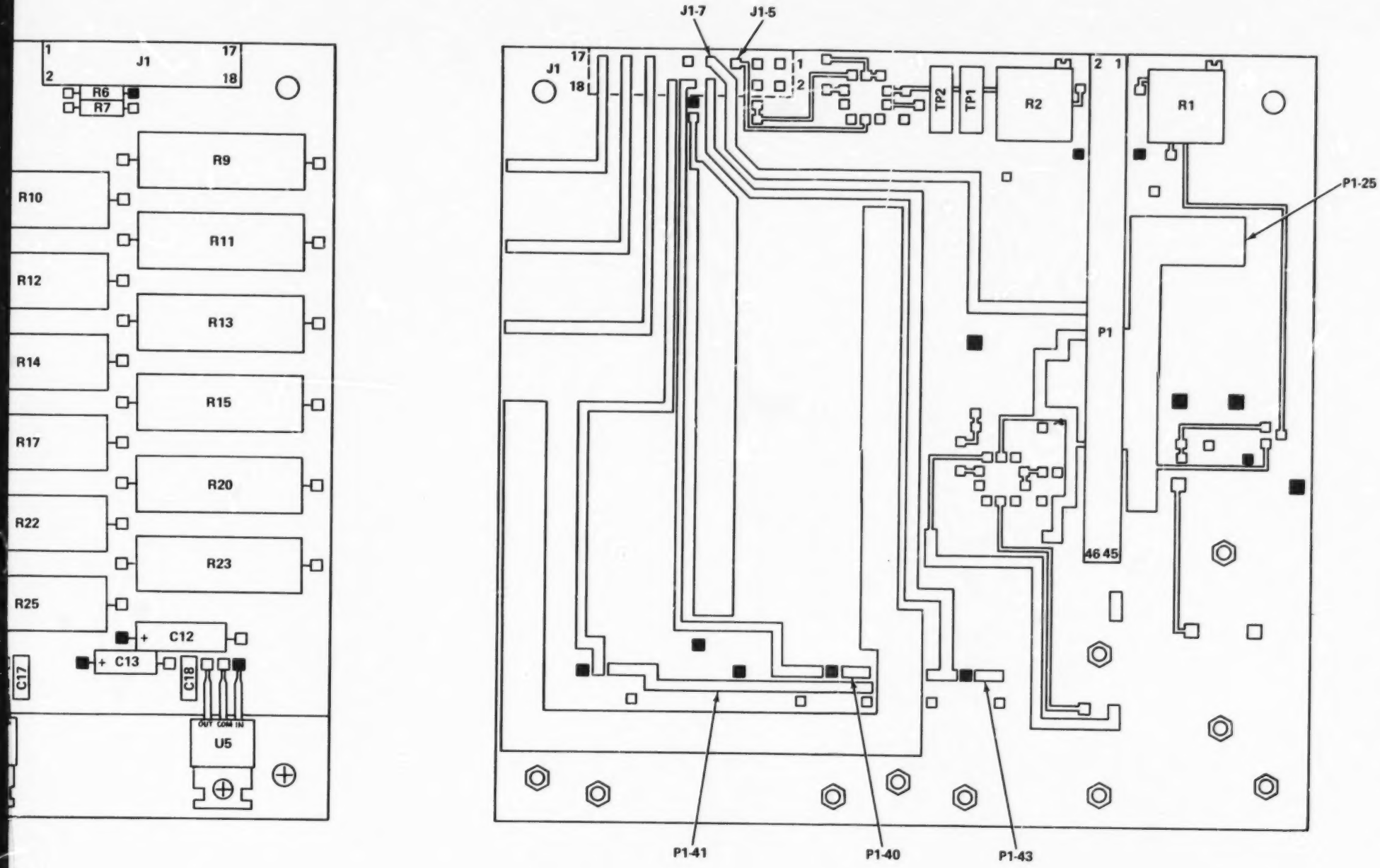
A5A2 (REAR VIEW)





A5A2 (FRONT VIEW)

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FO-7. Power Supply Assembly A5, Schematic Diagram

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